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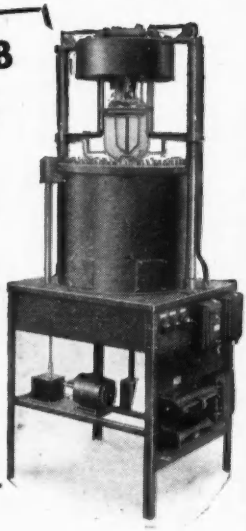

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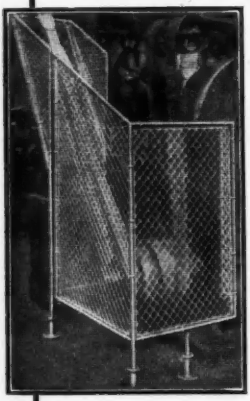

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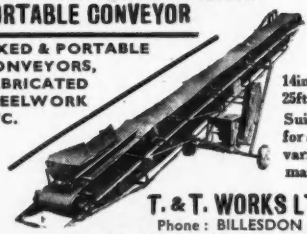

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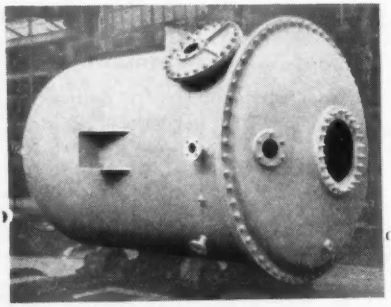

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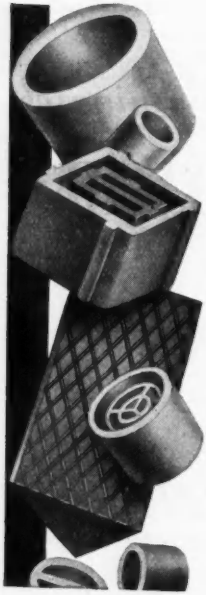

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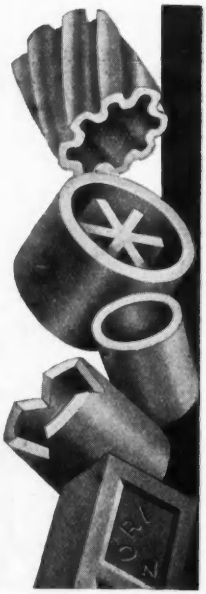

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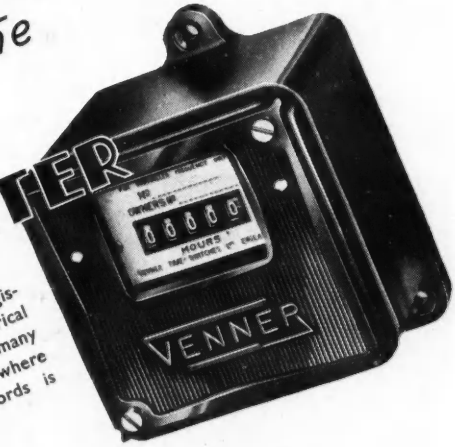

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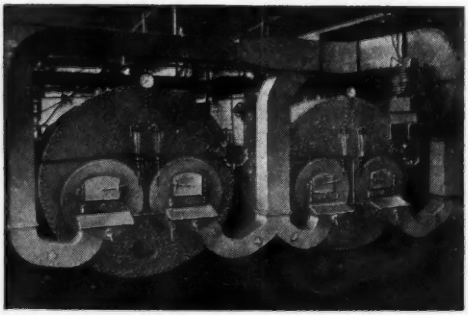

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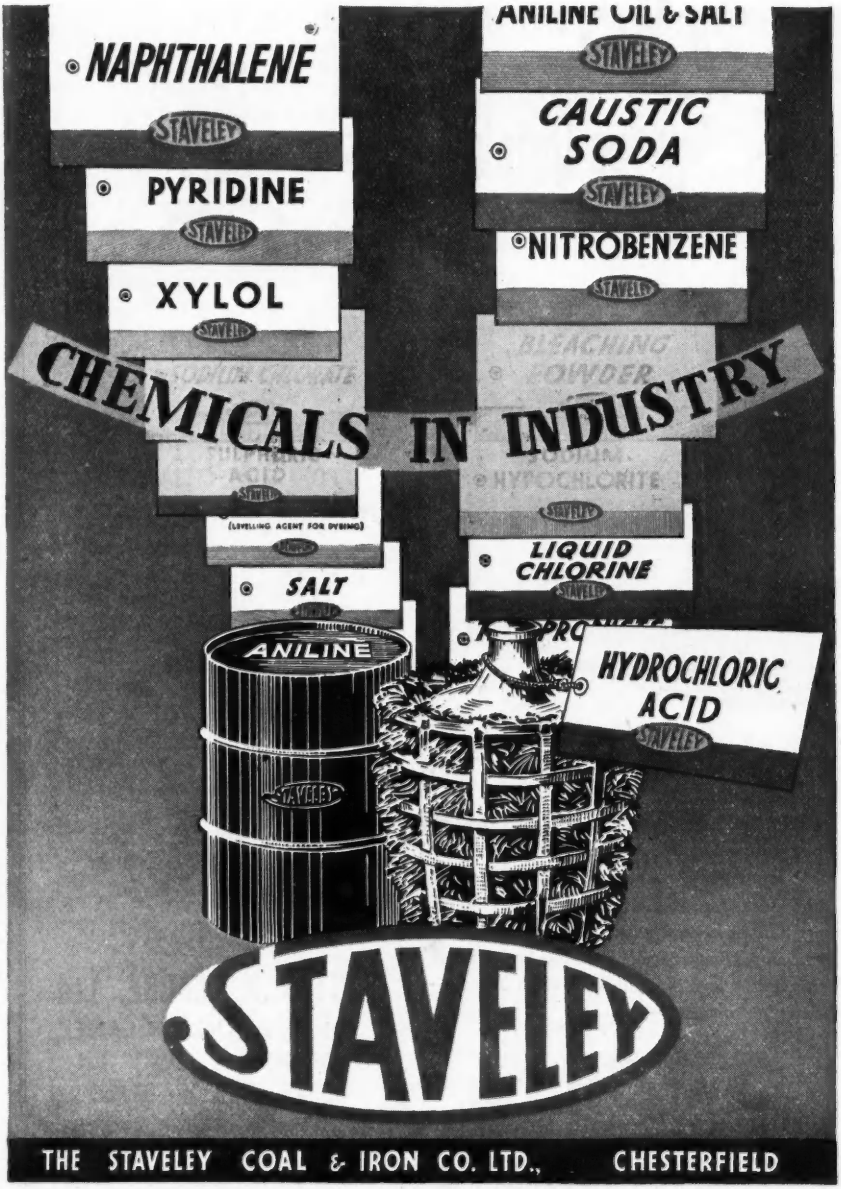
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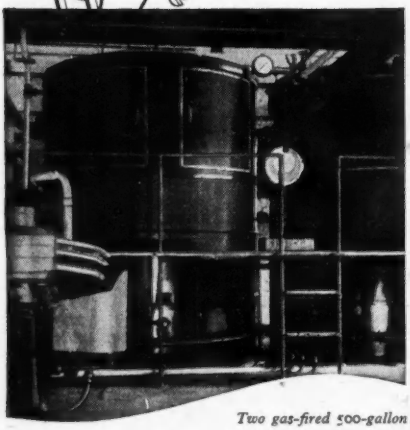

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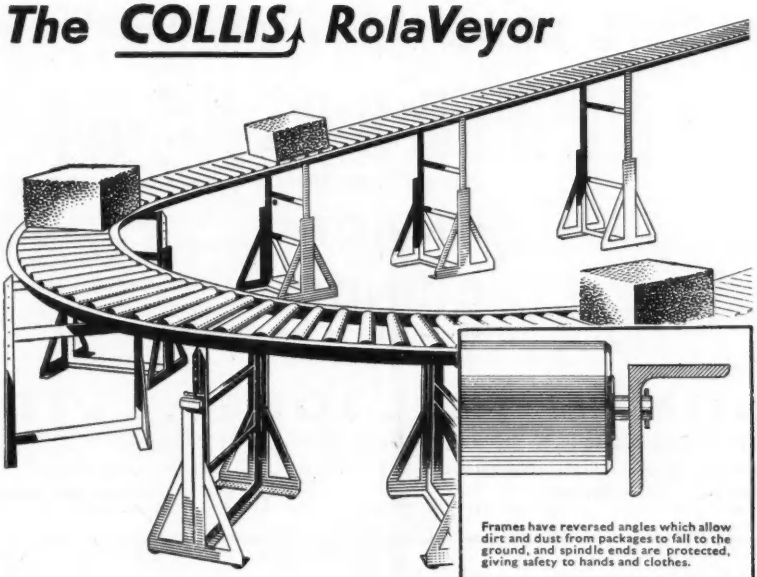

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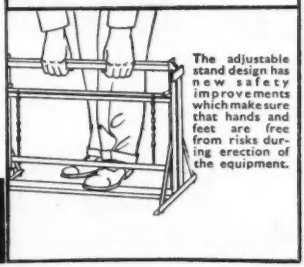

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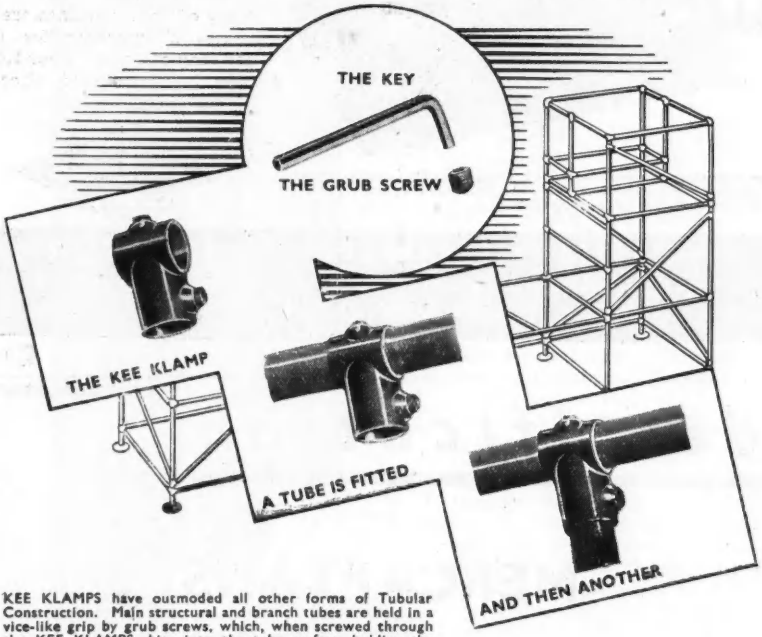

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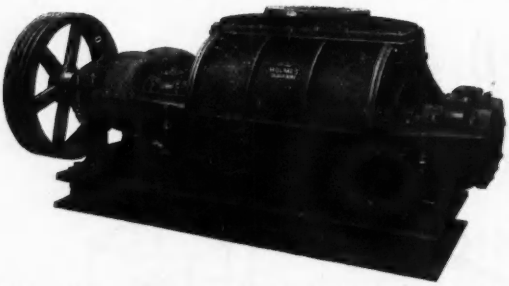

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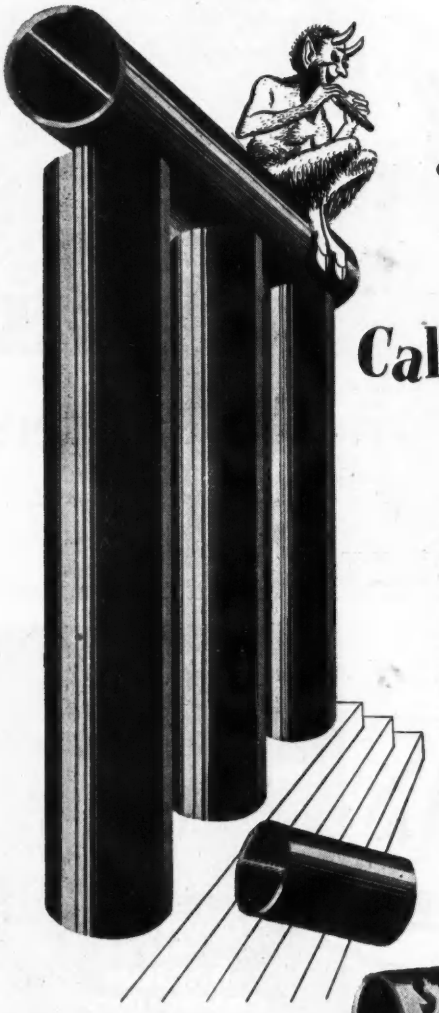

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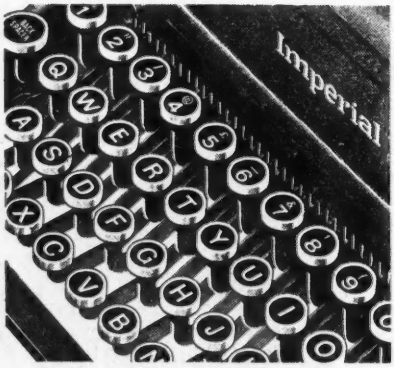

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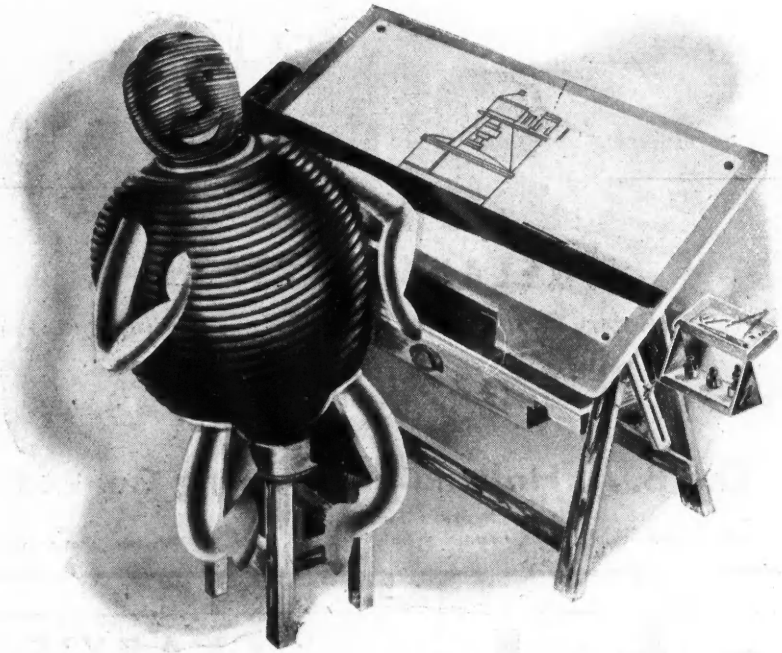

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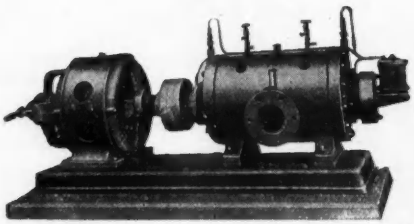

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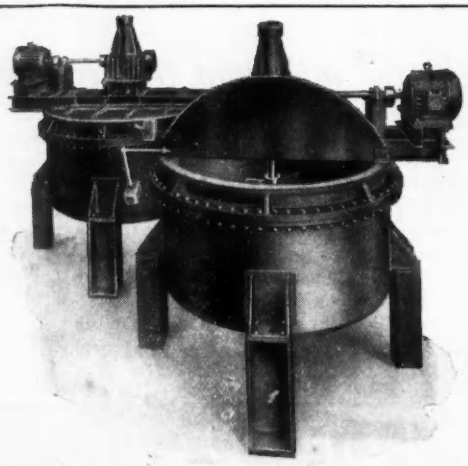

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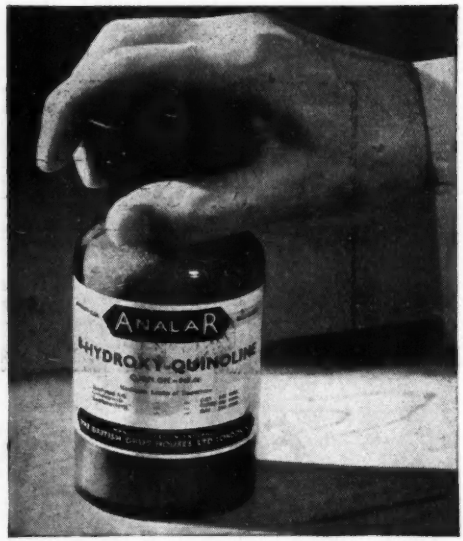

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VOL. LVI
No. 1444.

15 March, 1947

Annual Subscription 26s.
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Warning Figures

THE figures for Britain's imports and exports during January, given more fully on another page, show the first effects of the fuel crisis, the full effect of which, however, will not be visible for several months yet. Exports at £96,000,000 apparently compare favourably with £61,000,000 a year ago, but much of this balance is a mere paper figure due to increased prices for nearly all commodities. It is officially recognised that the volume of exports is only 12 per cent larger than in 1938, and in fact represents a decline of 8 per cent since last July. Imports, too, at £121,000,000 show an increase over January, 1946, but a decrease over the average for the last quarter of 1946.

On the surface the chemical picture appears somewhat confused, with the export of some chemicals increased and others considerably less. But on examination it will be seen that most of the increased exports were due in effect to the fuel crisis in that the home market could not absorb certain materials which were thus free to be exported. The most striking increase is in the export of tar oils, a feature standing out above all others on the credit side of the trading accounts. This increase from 101,101 gal. in January, 1946, to 5,206,779 gal. in this January, seems to have been caused by several influences, of which an increase in the world price was probably one. The principal cause, however, was undoubtedly the fact that the hydrogenation plants were unable to use these tar oils because of the shorage of fuel. Perhaps another factor was that coal in some countries is as much as £9 or £10 a ton, and it would obviously be an advantage in this case to import tar oils which is a satisfactory substitute for coal in many processes. There has been an increasing tendency on the Continent to adapt industrial plants to its use, and in the absence of any prospect of adequate supplies of coal either from Britain or the Ruhr, such a policy is inevitable and is likely to justify the substantial cost involved.

Direct effects of the coal cuts appear in the figure for sodium carbonate and soda ash, which dropped from 569,000 cwt. a year ago to 178,000 cwt. this January, while chemicals dependent on these also show repercussions. The world shortage of lead and oils and fats is reflected in the reduction of lead acetate exports from 27,000 cwt. to 4600 cwt., and glycerine from 20,500 cwt. to 7000 cwt. Increased demands for naphthalene by the plastics and other industries were probably responsible for the 50 per cent reduction in

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naphthalene exports. Fertilisers show an increase; they were probably being bought in large supplies for Greece, the Balkans, and Italy on UNRRA account.

Although these export figures are not in themselves very depressing, they do act as a pointer to further and possibly larger decreases in the next few months. As the Government is anxious to increase the export of chemicals it should take note of the warning contained in the January figures. It should give as big an allocation of coal as possible to the chemical industry so as to increase production and enable the industry to reach its export target figure.

NOTES AND COMMENTS

MONEY FOR SCIENCE

THE opportunity to congratulate the present Government on a realistic and far-sighted policy in relation to industrial problems does not occur every day. So it is with an approbation undimmed by habitual exercise that those best acquainted with the current needs of industry will receive the announcement of Government policy towards enlarging the country's scientific man-power, made by Mr. Hugh Dalton to the Parliamentary and Scientific Committee of the House of Commons. "I am prepared," writes the Chancellor of the Exchequer, "to find the necessary funds to enable the universities to plan a vigorous development campaign with confidence. We shall do all that can be done, consistently with the claims of other essential programmes, to ensure them the necessary priorities in men and materials to make that financial assistance practically effective." Characteristically, perhaps, the Chancellor takes a more rosy view than did the Committee of the number of qualified scientific workers the present scheme will make available in 1955. In his view the total of scientists on the active list in 1955, taking account of losses by retirement and (rather significantly) "by choice," will be 77,000, and in 1965 104,000.

"ELUSIVE" SALARIES

THE first figure is still admittedly 13,000 short of the total which the report of the Barlow Committee considered essential ("Notes and Comments, February 15) but it is substantially better than the first estimate of the Parliamentary Committee, which was that only by 1965 could the target of 90,000 active scientists be reached. The Chancellor has clearly studied very closely in a co-operative spirit the coming needs of all types of university in forwarding the plan. He is, he says, in favour of upgrading of constituent colleges to university status, but cautiously is less favourably inclined towards the upgrading of certain technical colleges, the source of so many of our highly qualified technologists. Too much emphasis on academic achievement at the expense of technology would, he felt, be the result. Mr. Dalton's unaccustomed liberality unfortunately does not extend to the remuneration of university staffs. Their rewards, he says, "are imponderable and elusive and not to be measured in money terms." "Elusive" seems to some at the moment to be the operative word.

FASHIONS IN FACTORIES

ATTENTION has been drawn in the Press to a recent decision of a County Court judge which indicates that employers will have to watch fashion changes closely. A girl, working in a factory, tripped and injured herself. She sued her employers who retorted that it was her own fault, because she was wearing high heels. But the Judge found for the girl and remarked in his judgment that employers must take into account the vagaries of fashion.

The case, however, is not reported in the official reports. We suppose that the girl sued under Section 26 of the Factories Act, 1937, which lays upon the employer this duty: "There shall, so far as is reasonably practicable, be provided and maintained safe means of access to every place at which any person has at any time to work." Or it may have been under Section 25 (1) which provides that "all floors, steps, stairs, passages and gangways shall be of sound construction and properly maintained." There is also Section 6 which provides that "where any process is carried on which renders the floor liable to be wet to such an extent that the wet is capable of being removed by drainage,

effective means shall be provided and maintained for draining off the wet."

In any event, the Judge said that in deciding what is " safe " or " of sound construction," he must take into account what the employees normally wore on their feet. As it was a normal fashion for the girls to wear high-heeled shoes in this factory, a means of access must be provided which would be safe in high-heeled shoes and it would be no defence to say that the girl would not have fallen over if she had been wearing Plimsolls.

So let employers beware. Perhaps they will console themselves, while studying the footwear of their feminine employees, by letting their eyes stray over the delicate ankles which are set off so well by high heels.

A STICKY PROBLEM

WHY does the egg stick to the highly polished surface of a new aluminium frying pan but not to an old one? The answer to this query—which sounds at first like one of those nursery conundrums of the order of " Which came first : the chick or the egg?" and evokes irrelevant reflections upon how anyone can honestly have come by an egg just now—is not as simple as it seems or far removed from the realm of chemical science and metallurgy. Like a lot of problems which combine to exacerbate the housewife, this may be another instance where an inquiring attitude by the chemist and metallurgist may yet save the bacon (or egg—when the egg is once more a practicable proposition). That, at least, is the view of the writer of a letter to *Chemistry and Industry*, whose nom-de-plume, " King Alfred," suggests he is no idle theorist. The crux of the problem, he says, is not so much that the egg sticks to the new pan, but that it does not stick when the pan has been in use a few months, nor does it seem to be much affected whether the pan has a matt, or highly polished surface. His view is that the oxide film which exists on aluminium is slowly conditioned in some way by fat and that it should be well within the power of an enlightened industry to produce the same result by scientific means at the start, possibly by anodic oxidation of the brightened surface and chemically sealing it. Since heat treatment of a variety of materials is not solely a kitchen stove problem it seems " King Alfred's " clarion call to rescue the egg may be as worthy of serious attention as another observant individual's deductions about steam and the kitchen kettle.

Foreman : ***We're putting a Bessemer converter to work tomorrow.***

Alf : ***Oh, the boys'll get on with 'im all right if 'he don't talk religion.***

DESIGN FOR PROGRESS

THE stride of modern scientific development is such as to demand the maximum adaptability and versatility in those whose interest or duty it is to keep pace with it. The interdependence, too, of one field of development with another forbids narrow confines of endeavour. As in international affairs to-day, progress is indivisible. Therefore we commend the initiative of the North-Western Branch of the Institution of Chemical Engineers in arranging the " refresher " course, details of which we give on another page. The basic idea of this course, we understand, is to provide chemical engineers with an opportunity to participate in a course concerned with a design problem which is outside their normal experience. This is described by the branch as a new venture and it certainly seems to be one that might well be widely extended, for it is precisely the thing to stimulate new ideas and prevent that fatal complex of the " watertight compartment." The subject of the course is to be the design of a plant to manufacture mononitroluene, the committee responsible for its promotion taking the view that a design problem is one to which both theory and practice can be applied with success. We are sure that the number of chemical engineers joining in the course and the ultimate benefits to them will prove the enterprise well worth-while.

Exports and Imports in January

Downward Tendency Continues

A CONTINUANCE of the downward trend in Britain's export figures by comparison with the high level recorded last July (20 per cent higher than 1938) is reflected in the Trade and Navigation Accounts for January. Total exports during the month were valued £91.2 million and, allowing for the rise in prices since 1938, the volume of exports is considered to be 12 per cent larger than in 1938, representing a decline of 3 per cent since November and 8 per cent since July. Imports, too, show a reduction at £121.4 million, £1.5 million less than the average in the last quarter of 1946. Retained imports were £116.3 million, more than half of which was for food, drink and tobacco; re-exports, £5.1 million, were less than in December but were otherwise the highest since November, 1945. A somewhat confused picture is presented in the chemical field where a fairly consistent reduction in most export categories is offset by a few large increases. Noteworthy in this connection are the figures for tar oils, showing a rise from 101,000 gallons to more than 5,000,000 gallons; for finished dyestuffs derived from tar (plus approximately 30 per cent); of sulphate of ammonia (more than doubled); and calcium carbide (nearly doubled). One of the more substantial reductions in exports is that of sodium carbonate and soda ash, from 569,620 cwt. to 178,623 cwts., and that same tendency is apparent in shipments of caustic, reduced from 526,283 cwts. to 145,038 cwts. The final export figure for chemical manufactures other than drugs represents an apparent improvement, from £3.015 million to £3,219 million.

EXPORTS OF CHEMICALS

	Jan., 1947	Jan., 1946
	Cwts.	Cwts.
Citric acid	912	7,749
Formic acid	1,254	920
Tartaric acid	162	167
	Tons	Tons
Aluminium oxide	1,781	58
Sulphate of alumina	1,718	2,667
Sulphate of ammonia	15,118	5,722
Nitrate of ammonia	15,038	9,449
	Cwts.	Cwts.
Chloride of lime	26,135	58,615
Calcium carbide	14,800	9,325
	Galls.	Galls.
Cresylic acid	233,502	208,312
Tar oil and heavy coal tar oils	5,206,779	101,101
	Cwts.	Cwts.
Naphthalene	2,944	7,304
	Tons	Tons
Copper sulphate	4,197	1,250
	Cwts.	Cwts.
Glycerine	7,054	20,517
Lead, acetate, etc.	4,626	27,325
Potassium compounds	20,822	14,027
Sodium chloride	Tons 11,738	Tons 15,772
	Cwts.	Cwts.
Sodium carbonate, soda ash, etc.	178,623	569,620
Caustic soda	145,038	526,283
Sodium - chromate and bichromate	2,605	4,340
Sodium sulphate, including salt cake	48,249	62,096
	Tons	Tons
Zinc oxide	943	2,682
	Cwts.	Cwts.
Finished dyes and dyestuffs obtained from coal tar	22,298	15,223
	£	£
Total Chemicals, drugs, dyes and colours	5,827,657	4,820,350

IMPORTS OF CHEMICALS

	Jan., 1947	Jan., 1946
	Cwts.	Cwts.
Acetic acid	10,978	4,405
Boric acid	—	1,900
Tartaric acid	200	2,072
	Tons	Tons
Phosphate	1,040	4,996
Fertilisers	11,951	15,187
Sulphur	28,218	4,001
	Cwts.	Cwts.
Potassium chloride (muriate)	394,621	373,981
Potassium sulphate	47,652	2,900
Carbon black	46,977	414
	lbs.	lbs.
Essential oils other than turpentine	276,617	435,002
	Cwts.	Cwts.
Turpentine	27,520	2,438

EXPORTS OF METALS

	Jan., 1947	Jan., 1946
	Tons	Tons
Iron and steel and manufactures	181,026	168,642
	Cwts.	Cwts.
Non-ferrous metals and manufactures:		
Brass	127,552	94,040
Aluminium	91,965	28,757
Nickel	6,449	3,170
	Tons	Tons
Copper	5,214	12,302
Tin	854	1,464
	£	£
Non-ferrous metals of all kinds	3,283,415	2,729,924

IMPORTS OF METALS

	Jan., 1947	Jan., 1946
	Tons	Tons
Iron ore and scrap	1,583,379	1,399,766
Non-ferrous ores and scrap (bauxite, chromium, copper)	138,000	184,000
	Cwts.	Cwts.
Molybdenum ore	29,543	162,057
	Tons	Tons
Tin ore and concentrates	750,410	133,596
Titanium ore	5,310	26,885
Tungsten ore	50,327	79,211
Zinc ore and concentrates	169,478	323,415
Iron and steel and manufactures	714,644	459,510
	£	£
Non-ferrous metals and manufactures	3,706,972	1,528,998

PROGRESS IN DRUGS AND FINE CHEMICALS—III*

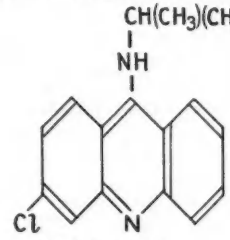
By G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

THE American work reported during 1946 (*J. Amer. Chem. Soc.*) has been directed towards the synthesis of variants on the pamaquine side chain and on the pamaquine nucleus. In respect of the latter the variants have covered not only variously substituted quinolines but also the use of alternative heterocycles to quinoline. Many of these drugs have proved to have some efficacy in avian malaria and continue to undergo examination. Meanwhile, Barber and Wragg (*J. Chem. Soc.*, 1946, 610) have prepared tetrahydropamaquine or 8-(4′-diethylamino-1′-methylbutyl) amino - 6 - methoxy-1 : 2 : 3 : 4 - tetrahydroquinoline and have found it to be better absorbed than, one-fourth as toxic as, and comparable in schizontal activity with, pamaquine in avian malaria. The same authors (*ibid.*, 613) have found that an open-ring analogue, in which the reduced pyridine ring of tetrahydroquinoline has been opened, resulted in complete loss of activity.

Action of Antimalarials

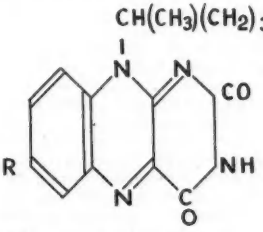
The mode of action of antimalarials has not yet been elucidated with any degree of certainty. Christopher (*Trans. Farad. Soc.*, 1943, *265*, 333) showed that these drugs interfered with the respiratory mechanism of the parasite. Madinaveitia points out that the chemotherapeutic approach from the standpoint of antagonism between the anti-malarial drug and the essential growth factors of the parasite is not as yet fruitful, since the essential growth factors in this case are not known. However, riboflavin bears some structural relationship with the acridine antimalarials. Selecting *L. casei*, e an organism which requires an extraneous supply of riboflavin, as a test organism, Madinaveitia has shown that only substances of the series which are known to be antimalarials are antagonised by riboflavin. The precise mechanism of the antagonism it is found difficult to envisage. Riboflavin combines with other substances to give a co-enzyme which in turn combines with the apo-enzyme. Does mepacrine prevent synthesis of the co-enzyme or does it compete with the co-enzyme for the apo-enzyme? Haas (*J. Biol. Chem.*, 1944, *155*, 321) is of the opinion that mepacrine forms an irreversible combination with the protein moiety of cytochrome reductase; that is, it is antagonistic towards the prosthetic group of this enzyme, which is riboflavin phosphate.

Neeman (*J. Chem. Soc.*, 1946, 811) has carried the elucidation of this problem a step farther forward. He found that the addition of the prosthetic group to the enzyme *before* the addition of the drug antagonised the action of mepacrine. One mol.



(1) Mepacrine

of riboflavin phosphate "neutralised" about 500 mols. mepacrine, so it is concluded that mepacrine is far from being an ideal antagonist. In the hope that, in substituting the acridine nucleus in mepacrine with the *iso*alloxazine nucleus of riboflavin, a more potent antagonist to riboflavin might be found, Neeman synthesised a series of 9-substituted flavins by the method of Kuhn

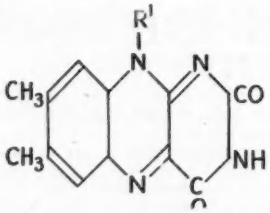


(2) R=H : (3) R=Cl

and Weygand (*Ber.*, 1935, *68*, 1282), which involves the condensation of alloxan with *N*-(ω-diethylaminoalkyl)-phenylenediamines. The 9-substituted flavins represented in this column and at the head of the next column did, indeed, retain the pharmacodynamic action of the drug. Unfortunately, the biological data is not available at the date of this review.

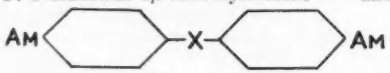
R. Wien has made comparisons between stilbamidines and phenanthridinium compounds in *T. congolense* infections. The

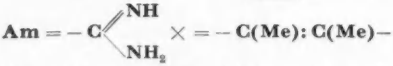
* Parts I and II of this review appeared in our issues of January 11 (pp. 72–76) and February 1, 1947 (pp. 184–191).



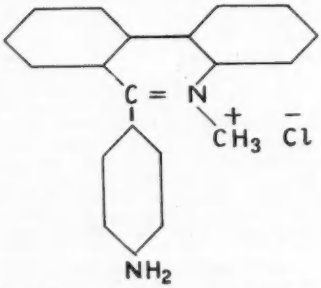
(4) Riboflavin (R^1 = Ribityl)

most active compounds of each series were compared, namely, dimethyl stilbamidine or 4 : 4′-diamidino-$\alpha\beta$-dimethylstilbene — and





7-amino-9-*p*-amino-phenyl-10-methyl-phenanthridinium chloride.



The phenanthridinium compound was found to be twice as toxic but twice as active against acute strains of *T. congolense*; but against one chronic strain the phenanthridinium compound was less active.

It has already been mentioned that the control of insect vectors by means of repellents and insecticides, while capable of considerable success in military operations by virtue of highly developed organisation and control, is not likely to be very effective when applied in normal conditions to control the two great scourges of the tropics—malaria and sleeping sickness. So far as malaria is concerned Sapero (*J. Amer. Med. Ass.*, 1946, *132*, 623), who had wide experience in the Pacific during the war, concludes that the main emphasis must lie on chemotherapeutic control in the human host, though he is fully appreciative of the contribution which repellents and insecticides have to make. Experiments, planned to control insect vectors in the tropics, particularly the anopheline mosquito responsible for malaria and the tsetse fly responsible for sleeping sickness, were conducted in East Africa under the direction of the Colonial Office (*Brit. Med. J.*, Dec. 28, 1946, 999). DDT or Gammexane applied in oily spray to two to four acres of jungle reduced the fly population by about 50 per cent. A second application of Gammexane in double the amount carried the reduction to 80 per cent. The effect was not, however, persistent under the particular climatic conditions. Repeated spraying over 50-60 days gave a reduction of 99 per cent. The spraying of rural native districts brought about a substantial reduction in the "malaria rate" among the natives.

Cases of poisoning by DDT have been reported since the publication of the correspondence on this matter following the Annual Review for 1945. A number of non-fatal cases have been reported by Mackerras and Wen (*Med. J., Australia*, 1946, *1*, 385) and the authors suggest that man is among the mammals which are more sensitive to DDT. Another non-fatal case is reported by Smith (*J. Amer. Med. Ass.*, 1946, *131*, 519). A fatal case reported by Bidon-Steele and Stukey (*Lancet*, Aug. 17, 1946, 235) involved the swallowing of DDT emulsion and the authors consider that the weight of the evidence was that DDT was the toxic agent though the toxic action may have been assisted by the solvent, methylcyclohexane. Taylor (*J. Ind. Hyg. and Toxicol.*, 1945, 320) has emphasised the dangers which are potential in man and animals from inunction with DDT. Stammers and Whitfield (*Nature*, 1946, *157*) give an account of exposure to kerosene solutions of DDT of Sinhalese, without protective clothing yet in a confined space, without apparent ill-effect. A number of other cases have been recorded in the literature during the past year.

Risk of Poisoning

The symptoms of mild and acute pain variously include loss of weight, mild anæmia, possible liver damage, polymorphonuclear leukocytosis, damage to central nervous system, spasms of extreme nervous tension, prostration, involuntary twitching of muscles, diminution of reflexes, alteration in auditory acuity, neusea, apprehension, sensation of tightness, vomiting. The lethal dose (L.D.50) for man has been estimated by Hill (*Brit. Med. J.*, 1946, 255) to be 150 to 600 mg./kg. bodyweight. The risk of poisoning depends, however, upon the form in which the material is contacted. There is little risk with dusts, but oily solutions and emulsions carry a high element of risk. Cameron (*Brit. Med. Bull.*, 1945, *3*, 233) considers the danger zone is entered when solutions of 10 per cent to 25 per cent are handled carelessly. He considers "that there is no danger consequent upon exposure to concentrations of DDT of about 0.5 per cent to 1 per cent, while the

ingestion of huge amounts of commercial dusts is necessary for toxic effect. The γ-isomer is more toxic than the commercial material except by cutaneous contamination.

Phillips and Gilman (*J. Pharmacol. and Exper. Therap.*, 1946, *86*, 213) have carried out studies of the pharmacology of DDT. The insecticide was administered to test animals in the form of an emulsion. The continuous phase consisted of saline, while the disperse phase in which DDT was dissolved was peanut oil. Lecithin was the emulsifier. The emulsion without the DDT had no significant pharmacological action. In rats, rabbits, dogs, cats and monkeys, the intravenous lethal dose is about one-tenth of the oral dose, and the former is followed by symptoms of intoxication within 5 to 10 minutes, as compared with a latent period of 10 hours after oral administration. Intoxication in mammals is manifest predominantly in muscle tremors and convulsions. These workers find that acute DDT intoxication can cause death by two mechanisms: (a) central excitation followed by depression and respiratory failure as, for example, in rats and the majority of rabbits, cats and monkeys; (b) ventricular fibrillation as in the case of the majority of dogs.

The same authors (*ibid.*, 1946, *86*, 287) have studied the relation between absorbability and comparative toxicity of DDT for insects and mammals. The L.D.50 for cockroaches as a typical insect was found to be:

Injection in acetone	5-8 mg./kg.
Application to body surface in acetone	10 mg./kg.
Injected as emulsion	18 mg./kg.
Injected in pea-nut oil	82 mg./kg.

The fact that the L.D.50 was found to be about the same for surface application as injection in the case of the cockroach is in sharp contrast with what is known to occur in mammals, and explains its important position as a potent insecticide which is *relatively* innocuous to man and other mamals.

Gammexane Toxicity

Taylor and Frodsham (*Nature*, 1946, *158*, 558) have assayed the toxic effect of Gammexane in man and animals in the light of the fact that little information was so far available on the possibility of chronic poisoning or of a cumulative toxic effect. There was some evidence, however, that toxic effects from Gammexane which might be residual on foodstuffs was remote. The median lethal dose of Gammexane (benzene hexachloride) containing 13 per cent of the gamma-isomer was found to be 1250 mg./kg. bodyweight in rats. Therefore, 500 mg./kg. were fed to rats on normal diet over 57 days. Growth was found to be normal, as well as general condition, both living and post-mortem DDT was similarly tested and 500 mg./kg. were found to give nervous symptoms within two days. A lesser dose, 350 mg./kg. per diem, with rats on normal diet was, however, tolerated with only occasional nervous symptoms. It was found that, by contrast with Gammexane, DDT reduced the growth rate of the rats at this level of administration, though no abnormalities were found in the organs. It is to be noted that DDT powder was used, and not commercial powder, and that it was not administered in oily solution. Gammexane, as Cameron has pointed out, is in contrast with DDT in that it gives no premonitory signs of poisoning which are so characteristic of DDT poisoning.

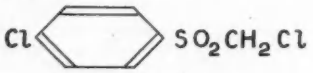
The mechanism of the action of DDT and of gammexane has been discussed in former Annual Reviews and it will be recalled that Slade (*Chem. and Ind.*, 1945, 314) advanced the suggestion that it might be antagonistic towards an essential metabolite, *i*-inositol. Kirkwood and Phillips (*J. Biol. Chem.*, 1946, *163*, 251) show this to be the case with yeast (*Saccharomyces cereviseae*) since the γ-isomer of gammexane inhibited growth while the inhibition was overcome by the addition of more inositol. Buston *et al.* (*Nature*, 1946, *158*, 22) bring further support to the findings of Kirkwood and Phillips, using the ascomycete, *Nematospora gosypii*.

Analogues of DDT

Forrest *et al.* (*J. Chem. Soc.*, 1946, 333) have studied the analogues of DDT present as components in the technical products. They have separated and identified the very feebly insecticidal "iso-DDT" or 1 : 1 : 1-trichloro - 2 - (2-chlorophenyl)-2 : 4-(chlorophenyl) ethane, which is always present, as well as small quantities of the half condensation product 1 : 1 : 1-trichloro-2-hydroxy-2-(4-chlorophenyl) ethane. If crude chloral is used in the manufacture of DDT there is also found present in technical DDT 1 : 1-dichloro - 2 : 2 - (4 - chlorophenyl) ethane, which has about one-third the insecticidal activity of DDT.

Busvine (*Nature*, 1946, *158*, 22) has assayed several new synthetic contact insecticides against body-lice and bed-bugs, using pure DDT as a standard of reference on the basis of median lethal doses. "Lauseto," a mixture of DDT and its analogues 2 : 2-bis(phenyl)-1 : 1 : 1-trichlorethane and 2-phenyl - 2 - 2 - chlorphenyl-1 : 1 : 1-trichlorethane, obtained by reacting benzene with chlorbenzene and cloral, was found to have about one-quarter of the toxicity of pure DDT towards lice. Another German insecticide, "Gix" or 2 : 2-bis(*p*-fluorphenyl)-1 : 1 : 1-trichlorethane, was found to be much less toxic than DDT towards lice and bed-bugs. "D.D.D." or "T.D.E.," which is 2 : 2-bis(chlorphenyl)-1 : 1-dichlorethane, has been offered commercially in the United States and has been claimed to have the same order of toxicity towards insects but to be decidedly less toxic to mammals; Bus-

vine found this substance to have about one-third the toxicity of DDT towards the lice and bed-bugs used in the test. Pure Gammexane was found to be outstandingly highly insecticidal towards lice. Another German insecticide "Lauseto neu," which is of an essentially different chemical type and is chlorphenyl-chlormethyl-sulphene, was found to be more toxic to bed-bugs and lice than DDT, but its use is likely to be limited by its low solubility in refined mineral oils.



Lauseto Neu

Busvine later set out his work *in extenso* (*Chem. and Ind.*, 1946, *65*, 356), from which it appears that the work was undertaken to find an insecticide with more satisfactory physical properties than DDT; to determine the effects of modifications of the molecular formula on insecticidal power in the hope that the data assembled might also provide information on the mode of action of DDT. Also it was desired to determine the relative insecticidal values of two analogues of DDT, the manufacture of which is not covered by the Geigy patents, one of which "Gix" (referred to above) was manufactured commercially in Germany by the I.G. Farbenindustrie and the other "Rhothane D3" in the United States. Busvine found that the "fluorine-DDT," which was the active component of Gix and which is, as the appellation indicates, the fluorine analogue of DDT, was comparatively ineffective. Rhothane D3, which is dichlordiphenyl-dichlorethane, an analogue of DDT in which one of the chlorine atoms in the ethane nucleus has been substituted by hydrogen, was less effective than DDT against lice, bed-bugs and the mosquito *Aëdes ægypti*. Busvine finds that the two theories to account for the mode of action of DDT are not supported by consideration of the activities and structures of the forty-one compounds he studied. These theories are: first, that of Läuger *et al.* that the toxic component is the linked *p*-chlorbenzene rings; and, second, that of Martin and Wain that the chlorbenzene rings confer lipoid solubility while the rest of the molecule confers toxicity by splitting off hydrochloric acid at the seat of activity. Busvine points out that most of the toxic analogues of DDT resemble the DDT molecule in shape and weight, and he concluded that a more likely theory of a mode of action is that the whole molecule is involved in a steric association with a vital enzyme.

The past year has seen the announcement of an outstanding achievement in the synthesis of the vitamin-like substance, folic acid, deficiency of which in experimental animals produces not only an anaemia but a granulocytopenia. The complex story of folic acid goes back to just over 20 years ago when Minot and Murphy (*J. Amer. Med. Ass.*, 1926, ii, 470; *Brit. Med. J.*, 1927, ii, 674) introduced the administration of liver in the treatment of human pernicious anaemia, an advance based on the earlier work of Whipple *et al.* (*J Amer. Med. Ass.*, 1920, *53*, 36) who found that the administration of liver to dogs which had suffered haemorrhage promoted the regeneration of blood. It was necessary to administer very large amounts of liver orally to the point of nausea, and consequently early attempts were made to concentrate the fraction responsible for alleviating the condition. The dose required for remission of the disease was soon reduced to about 20 mg. concentrate, with the daily maintenance dose reduced from 400 g. to less than 1 mg. and the oral administration of liver sandwiches substituted by the more convenient injections. In some cases injection has proved to be more than a convenience where the intestine wall is impermeable to the active principle. In 1927, Cohn *et al.* (*J. Biol. Chem.*, 1927, *74*, 69) obtained a liver concentrate to which pernicious anaemia responded which was free from the known vitamins (vitamin B_1, riboflavin, pyridoxin-pantothenic acid, which is also present in liver, was not then known). It was, however, not an entirely suitable preparation owing to the excessive protein content and a substance which caused a fall in blood-pressure. Castle and Taylor further concentrated Cohn's principle (*J. Amer. Med. Ass.*, 1931, i, 1198; *Lancet*, 1931, i, 857; *J. Amer. Med. Ass.*, 1931, ii, 313) by means of heat precipitation of aqueous extract of fresh liver to remove proteins and fractional precipitation with alcohol, such that 2 ml. of the sterile aqueous solution for parenteral injection was equivalent to 10 g. liver.

Further Purification

In 1935, Dakin and West (*J. Biol. Chem.* 1935, *109*, 489) carried the purification a step further. Starting with Cohn's "Fraction G" they obtained a potent product in 1 per cent yield after a series of manipulations involving the removal of inert material with alcoholic calcium acetate and precipitation of the principle with Reinecke salt. The principle was regenerated by dimethyl-aniline and amyl alcohol and further purified by repeated precipitation with salt solutions. This gave a preparation which has become known as "Anhaemin." This was found to give reactions for aminohexose and amino acids on hydrolysis. It was considered to be a peptide which gave some (but not all) of the reactions of albumen. Pyrimidine and purine bases were found to be absent. In 1936, Wilkinson at Manchester achieved the highest concentration

to that date through the Reinecke acid salt by which 18-36 mg. of the preparation was sufficient to give complete remission of pernicious anaemia.

Day, *et al.*, 1935, postulated the existence of a "vitamin M" for monkeys which was never identified but which was found not only in liver but also in yeast and the vitamin B complex. Absence of this vitamin M from the monkey's diet caused the development of a fatal blood disease characterised by anaemia, leucopenia and often by diarrhoea and gingivitis.

Further advances occurred in 1937. Wills, *et al.* (*Lancet*, 1937, i, 311) fractionated a liver concentrate into two parts; the one was, like Day's "vitamin M," effective against the nutritional macrocytic anaemia of monkeys while the other, the anhaemin fraction, was inactive against this particular anaemia but was a cure for pernicious anaemia. In the same year Subba Row *et al.* postulated the existence of more than one principle in the sense that liver contained a principle and three accessory factors. The three accessory factors were found to be inactive by themselves, but when they were added to the primary factor the latter gave better response in pernicious anaemia than when administered alone. He characterised the three accessory factors to the extent of describing them as l-tyrosin, a complex purine and a peptide. The complex purine was later found to be an impure mixture of xanthine and a strongly fluorescent xanthopterin.

Other Factors

Another approach to the central problem was by the route exploited by Stockstad and Manning, 1938, who found a dietary factor to be necessary for chicks which was found in yeast and other natural food. They called it "Factor U." In the next year this work was confirmed by Hogan and Parrott, who found a member of the vitamin B complex to be anti-anaemic for chicks, and this they described as vitamin B_c. In 1940 an unidentified member of the B-complex was found essential for the growth of *Lactobacillus casei* ϵ in synthetic growth medium containing all the essential amino acids. This became known as the "L. casei factor" or the "norite eluate factor" (from yeast extract). In 1941 another factor was found to be widespread in green leaves—and was hence called "folic acid"—which was an essential growth factor for *Streptococcus lactis R.* It was later found in leaves, spinach, mushrooms, yeast, liver and kidney, and it closely resembled the L. casei factor. The identity, however, has never been established beyond doubt.

In 1942 more refined physico-chemical methods were applied to the further concentration of the liver factor. Electrophoretic techniques split the concentrates into "fast" and "slow" fractions. Laland and Klem concentrated the principle in 100 grams of liver to 0.2 to 0.3 mg. by means of adsorption methods; but the anti-anaemic factor seemed to become dispersed among a number of fractions according to this technique. Adsorption methods had already been applied by Karrer *et al.* in Switzerland, who had obtained concentrates resembling those of Wilkinson in activity. He found the principle to be free from flavin, pterin, and reducing carbohydrate and to yield amino acids on hydrolysis.

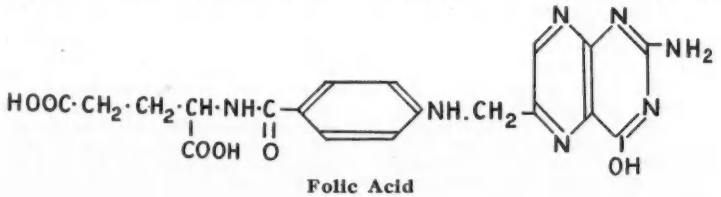
Isolation in Crystal Form

In 1943 the L. casei factor was isolated from liver in a crystalline form by Pfiffner *et al.*, while Stockstad also isolated the factor from liver and yeast. There seemed to be some differences between the preparations of the factor according to the source which were reflected in the growth responses of the test organism. In 1943, Stockstad (*J. Biol. Chem.*, 1943, *149*, 573) established the fact that the L. casei factor from liver possessed homopoietic activity for animals.

The situation at this point was that there were a number of uncharacterised, but possibly related, factors in the B-complex which had the following features:

"Vitamin M"—the absence of which accounted for a pellagrous syndrome of anaemia, leucopemia, diarrhoea and mouth lesions in the monkey.
"Vitamin B_c"—the absence of which resulted in anaemia in chicks.
"Vitamin B_{10} and B_{11}"—responsible for normal growth and feather development in the chick.
"Liver norite eluate factor" and "Lactobacillus casei factor"—both of which are essential growth factors for *L. casei* ϵ and *S. faecalis R.*

There then followed a period during which no progress was recorded until the announcement of the synthesis of folic acid and the publication of the physico-chemical and biochemical properties of synthetic folic acid, which showed it to be identical with the natural L. casei factor from liver.



Folic Acid

Folic acid has been identified by degradative methods as *N*-(4-[(2-amino-4-hydroxy-6-pteridyl) methylamino]benzoyl)-glutamic acid, and its synthesis by two methods has been described by Angier *et al.* (*Science*, 1946, *103*, 667). In the first method of synthesis 2 : 4 : 5 - triamino - 6 - hydroxypyrimidine, *p*-aminobenzoyl-l(+)-glutamic acid and 2 : 3-dibromopropionaldehyde are reacted in equimolecular amounts in the presence of acetate buffer. The resulting crude product contained 15 per cent $^{w}/_{w}$ of active compound by microbiological assay. It was found that a dihydro derivative was first formed by condensation which, in the course of the action, was transformed to the active product. The crude product could be further purified by removal of the non-active material by precipitation and absorption on carbon, the folic acid being finally crystallised from hot water.

In a second method of synthesis 2 : 3-dibromo-propionaldehyde is reacted with pyridine and the product condensed with 2 : 4 : 5-triamino-6-hydroxypyrimidine to give *N* - [(2-amino-4-hydroxy-6-pteridyl) methyl] pyridinium chloride. This last product is reacted with *p*-aminobenzoyl-l(+)-glutamic acid and sodium methoxide in ethylene glycol at 140°C. The crude product contains 15 per cent $^{w}/_{w}$ active material which may be purified by the procedure briefly outlined above.

As a point of interest, it was found that if the glutamic acid derivative in the second method of synthesis was substituted by *p*-aminobenzene acid a compound was obtained which was active for *Streptococcus faecalis*, but inactive for *Lactobacillus casei* or for the chick. Folic acid is a bright yellow crystalline solid. The most active preparations of pernicious anaemia liver principle is white, and it is not claimed that the liver principle and folic acid are identical. It seems possible that folic acid derived from yeast may differ from the synthetic folic acid which is now available in very limited supply in the number of glutamic acid molecules therein.

Value as Therapeutic Agent

The status of folic acid as a therapeutic agent is at present undergoing assessment. The picture is not easy to shape since other factors seem to overlap with it, and on account of the widespread occurrence of the substance, folic acid nutritional deficiency has not been characterised in man. It may be that folic acid will prove to be an extrinsic factor, acting as an enzyme or co-enzyme which may catalyse the synthesis of the homopoietic principle in cases of pernicious anaemia and possibly other forms of anaemia (*see* Davis, *Science*, 1946, *104*, 37, Spies, *infra*). Folic acid has been found to be ineffective in iron deficiency anaemias as well as in some types of anaemia which respond to liver concentrate therapy. It would seem to be, however, a powerful therapeutic agent in Addisonian pernicious anaemia, nutritional macrocytic anaemia, sprue and macrocytic anaemia accompanying pellagra (*Lancet*, Nov. 9, 1946, 680).

Carruthers (*Lancet*, 1946, i, 849) obtained startling results in India, where he treated patients with hypochronic anaemia accompanied by chronic diarrhoea which was not dysenteric. The anaemia was not affected by folic acid, but the diarrhoea was cleared up. Spies (*Lancet*, June 15, 1946, 883; *Blood*, 1946, *1*, 271) administered 20 mg. synthetic folic acid per diem for 13-18 days to patients with macrocytic anaemia, which had previously shown haemoglobin response to liver extract and had been allowed to relapse. Within 3-4 days of the commencement of injection the patients felt "a definite upsurge of well-being," with increase in haemoglobin percentage and reticulocyte count. A similar response was obtained with 50 mg. folic acid administered per os. Spies also noted that, in patients suffering from tropical sprue, the radiological pattern of the bowel returns to normal and the excessive irritability disappears when folic acid is administered.

Complex Natural Factor

Hall (*Biochem. J.*, 1946, *40*, xlii) points out that the evidence is increasing that folic acid synthetic is not identical with the naturally occurring factor and that the latter is more complex. From the spectroscopic evidence of Mitchell, as well as that of others, folic acid is known to have a xanthopterin nucleus. In quinoxaline, a substance is presented which has a nucleus analogous with that of folic acid, but in which the carbon has been replaced by nitrogen, and the question arose as to whether quinoxaline would antagonise folic acid, which is an essential growth factor for *Streptococcus lactis*. It was, in fact, found that growth was inhibited by this substance. The complexity of the situation regarding homopoietic substances is further revealed by its relationship to thymine, 2 : 6-dihydroxy-5-methylpyrimidine, which may be obtained by deanimation of 5-methylcytosine which, in turn, may be obtained by digestion of nucleoproteins. As far back as 1941, Snell (*J. Biol. Chem.*, 1941, *139*, 475) found that thymine can replace folic acid as a growth factor for lactic acid bacteria. Spies (*Blood*, 1946, *1*, 185; *Lancet*, June 15, 1946, 883; *J. Amer. Med. Ass.*, 1946, *131*, 1096) has now found that thymine can be used successfully in the treatment of sprue and pernicious anaemia and that the clinical and haematological improvement resembles that following the administration of folic acid. Spies suggests that folic acid may be the enzyme or co-enzyme in the synthesis of thymine or a thymine-

like compound and that the synthesis may occur in the gastro-intestinal tract. This is in accordance with the suggestion made by Stokes, who believes that the thymine or thymine-like compounds thus formed are used in the synthesis of nucleic acid. It has, however, been found that very large daily doses of thymine (15 g.) are required as compared with folic acid (20 mg.) for similar therapeutic effect. This work on thymine has also been confirmed by Lopez and Toca (*Lancet*, June 15, 1946, 883).

Another interesting aspect of the biochemistry of folic acid (pteroylglutamic acid), which is, at the same time, a link with chemotherapy, is opened up by Ratner and his co-workers. It is now well known that the mechanism of sulphonamide therapy involves a competition between the sulphonamide (possibly the sulphanilamide moiety) and *p*-aminobenzoic acid for an enzymic substrate, and it has been suspected for some time that a derivative of *p*-aminobenzoic acid was involved in the competition and not the acid itself. These workers, therefore, explored the various forms in which *p*-aminobenzoic acid existed in yeast, commencing with the observation of Blanchard (1941) that the *p*-aminobenzoic acid was indeed bound through the amino group. Ratner found that *p*-aminobenzoic acid also existed in a conjugated form in which the carboxyl group is bound through a strongly acidic polypeptide while the arylamino group of the acid is free. This form accounted for 20-30 per cent *p*-aminobenzoic acid in yeast, 400 mg. of the polypeptide were obtained from 50 kilos yeast, which represented a yield of only about 8 per cent of that estimated to be present. Provisionally the authors assigned a structure in which there existed one terminal *p*-aminobenzoic acid, one amide group, ten or eleven l-glutamic acid residues and one unknown amino acid residue probably acidic in nature.

Now, the interesting thing is that the paper dealing with the above work was completed by Ratner and his co-workers prior to the publication of the paper by Angier and his co-workers on the constitution and synthesis of their synthetic folic acid. Ratner observes in a note that it appears that an essential part of the folic acid molecule is analogous to the *p*-aminobenzoic acid peptide of yeast. There remains to be determined whether a functional relationship exists between the *p*-aminobenzoic acid peptide of yeast and the various conjugates of folic acid.

The pyrazine nucleus is becoming of increasing interest because of its relationship (as a substituted pyrimido-pyrazine) with folic acid as well as xanthopterin and leucopterin, which have recently been identified as pigments of butterfly wings. Pterins also occur in mammalian liver and urine, and it is possible that an anti-anæmic factor obtainable from gastric extracts is a pterin. Riboflavin (vitamin B) is also a benzo substituted derivative of this same nucleus. Spring *et al.* (*J. Chem. Soc.*, 1946) describe the synthesis of hydroxypyrazines which are related to the antibacterial compound aspergillic acid. Taylor *et al.* (*J. Amer. Chem Soc.*, 1946, *68*, 1996) have studied the synthesis of the pyrimidopyrazine nucleus especially by the method of Kuhn and Cook (Ber., 1937, *70*, 761), in which the pyrazine ring is formed by reacting a substituted pyrimidine ring compound with 1 : 2-diamino groups and 1 : 2-dicarbonyl groups.

(To be continued)

PETROLEUM SULPHONATES

A BOOKLET just published by Petromor, Ltd., "The use of Petroleum Sulphonates in industry," gives interesting and useful information on these chemicals.

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Powell Duffryn's New Activities

A BIG new organisation which will send out teams of experts to help industry in all matters of fuel efficiency, production and utilisation has been set up. The new company, Powell Duffryn Technical Services, Ltd., a subsidiary of the Powell Duffryn Group, formerly the largest colliery undertaking in the world, has as its chairman, Mr. Robert Foot, lately chairman of the Mining Association of Great Britain.

In announcing the formation of the new organisation Mr. Foot said it would not stop merely at advising on fuel matters, but would arrange and supervise the installation of new plant where necessary, and will itself go into the manufacturing business, *e.g.*, of plastics.

He emphasised the need for high efficiency, the essential pre-requisite for high production, and pointed out that industries overburdened with problems of increasing production simply have not the staff to undertake fuel efficiency investigations and replanning. "It has been calculated," Mr. Foot went on, "that an increase of 15 per cent in the coal utilisation efficiency of the whole country would produce an addition to the national income of £200,000,000. These savings cannot be secured only by the correction of obvious faults. They entail new methods of a highly technical character that will require the advice of experts of the highest calibre.

"Although the mines of the Powell Duffryn group have been transferred to the National Coal Board, it retains its existing service organisation for promoting efficient fuel utilisation, and this is capable of great expansion. All this experience and knowledge accumulated in our vast enterprise will now be placed at the disposal of industry in general, both at home and abroad, through an organisation covering as independent consultants the whole range of problems which fall broadly within the definition of fuel production, distribution and utilisation.

"The immediate aim of the new organisation is, (1) to place at the disposal of industrial undertakings a highly qualified and impartial advisory and consultant service to deal with the efficient and economical use of all types of fuel for all industrial purposes and processes, including the problems of heat, steam and power utilisation in the individual factory; to investigate and advise on desirable changes and the economies to be achieved thereby; to arrange and supervise the installation of necessary new plant; (2) to act as consultants on any aspect of mining, particularly coal mining, anywhere in the world."

In this last connection, Mr. Foot said they had a team of experts in India at this moment advising on coal mining there. They were ready, and indeed eager, to help in the colonies and abroad, and were willing in some cases to finance the mining operations themselves.

Mr. Foot mentioned that they are investigating the fuel problems of one of the largest industrial firms in the country.

Other directors of the new organisation are Mr. E. L. Hann, chairman and managing director of Powell Duffryn, Mr. J. G. Bennett, Director of the British Coal Research Association, and Mr. W. L. Boon, for many years general manager of the London Counties Coke Association.

More Fuel for N.W.

NINETY-THREE Army five-ton tipper lorries of Western Command recently left Ladysmith Barracks, Ashton-under-Lyne, to fetch coal from the Clay Cross pits near Chesterfield for use in the North-West. Simultaneously another 100 lorries of Northern Command, already loaded, left Clay Cross for Manchester. A daily shuttle service has been maintained, each convoy carrying a load of nearly equivalent to one coal train. Firms selected to receive coal under the operation "Coal Cast" include the I.C.I. works at Northwich and Runcorn.

Other means of reducing the effects of the fuel shortage are being adopted by a large section of the steel industry, which is to be converted rapidly to oil firing in a bid to secure record production this year, in spite of the continuing shortage of coal. By the end of this month, states *The Liverpool Daily Post*, equipment using 400,000 tons of oil will have been converted and the industry expects to be using oil at the rate of 1,000,000 tons a year by the end of 1947. This will save the nation about 2,000,000 tons of coal every year. Steel prospects for this year are that between 13,000,000 and 13,500,000 ingot tons will be produced and that if conditions prove extremely favourable this total will be stepped up to 13,750,000 tons. The industry confidently expects to set up an all-time production record this year. The highest output in any peace year was 12,984,000 tons—in 1937.

The reverse side of the picture is reflected by the news that the Port Talbot and Margam Steelworks of Guest, Keen & Baldwin have suspended production for an indefinite period owing to coal shortage.

Chemicals from Petroleum

Shell Company's Venture

PLANS for the building of a plant by the Shell Company costing several million pounds on an 85-acre site at Thornton-le-Moors, Cheshire, for the manufacture of acetone and many other chemicals from petroleum was announced on Tuesday.

Other plans of the Shell Company announced at the same time are for the extension of the Stanlow and Shell Haven plant which manufacture sodium higher alkyl sulphates and insecticides and fungicides.

Initial production at Thornton will be about 24,000 tons annually and the production of increased quantities is already contemplated. A wide range of chemical solvents are to be made, including: acetone, methyl ethyl ketone, methyl isobutyl ketone, isopropyl alcohol, diacetone alcohol, secondary butyl alcohol, tertiary butyl alcohol, mesityl oxide, methyl isobutyl carbinol, isopropyl ether,

Many Applications

These chemicals have many applications in the chemical and allied industries. The solvency power of the materials is used in the pharmaceutical industry for the extraction of drugs and essential oils and the chemical reactivity of the substance—particularly the ketonic group of materials such as acetone and methyl ethyl ketone—is a property of extreme value in the synthesis of drugs of the chloroform and iodoform type. In the cosmetics industry, solvents such as acetone, isopropyl alcohol, and secondary butyl alcohol are employed in the preparation of nail varnishes, nail varnish removers, toilet waters, rubbing alcohols and hair fixatives. The possibilities of using petroleum chemicals for organic synthesis are very wide in view of the reactivity of these compounds and they are used to a considerable extent in the manufacture of perfumery chemicals. As an example, tertiary butyl alcohol is a valuable raw material for the preparation of artificial musks and, moreover, has suitable properties enabling it to function satisfactorily as a carrier for essential oils in perfumes and lotions.

Tertiary butyl alcohol finds application as an alkylating agent in the preparation of complex phenols having high Rideal-Walker coefficients. Naphthenic acids as naphthenates are used as emulsifiers, rot-proofing preparations and paint driers.

In addition to the chemicals scheduled for initial production at Thornton, there are a number of chemicals in the development stage which will come into large-scale production at a later date. These chemicals have considerable interest to the chemist engaged in industry and although as yet only available in small quantities for research and laboratory purposes they have technical possibilities of entering into many syntheses leading to novel products.

The output of the new plant at Thornton will cover a substantial part of Britain's needs of the range of chemicals produced, partly replacing products at present imported from the U.S.A., and helping to meet new needs. At the present level of prices, the importation of these products would entail a dollar expenditure of about $4 millions a year.

Owing to its modern character and to the use of the most up-to-date processes and automatic methods of control, the operation of the new chemical plant will make only a small demand upon man-power: about 200 workers and staff will be employed. The value of output per employee will be among the highest in Britain's basic industries.

The extension of existing plant at Shell's specialised refinery at Stanlow, on the Manchester Ship Canal, for the manufacture of sodium higher alkyl sulphates used as detergents and wetting agents for industrial and domestic uses will give much bigger output.

Production has recently been increased from 12,000 tons a year to 24,000 tons a year, and a further expansion of output to 50,000 tons a year is projected within the next two years.

By the extension of the existing plant at Shell Haven, Essex, for the manufacture of insecticides, fungicides and other products used in agriculture, a capacity of 30,000 tons a year will be reached.

"Refresher" Course in Design.—The North-Western branch of the Institution of Chemical Engineers proposes to hold a 3-day "refresher" course in Manchester in September, the subject being the design of a plant to manufacture mononitroluene. Mr. Mr. M. B. Donald is to act as co-ordinator for the problem, assisted by Messrs C. H. Bowden, J. M. Coulson, F. Rumford and F. E. Warner, who will deal with process information, physical design, flow sheets and mechanical design. The course will be residential or non-residential and open to all engaged in the chemical industry. The number of places will be limited; and provisional application should be made now to Dr. J. S. Hunter, 22 The Crescent, Northwich, Cheshire.

American Chemical Production

Totals for 1941-45 Show Decline

A SMALL but consistent decline from the high production peak attained in 1943 and 1944 is shown in the summary of production of basic chemicals currently issued by the U.S. Bureau of the Census. The figures, of which some of the representative examples are reproduced below, cover the period 1941-45 and add data of monthly production, January-October, in 1946. The latter, in general, reflect the continuance of the slow decline in production observed in 1945. There are, however, a few exceptions, notably sulphuric acid, production of which rose steadily from 4,703,193 short tons in 1943 to 5,517,873 in 1945, sodium bicarbonate, soda ash, and sodium hydroxide produced by the lime-soda process.

TOTAL PRODUCTION (SHORT TONS)

	1945	1944	1943	1942	1941
Ammonia	548,655	543,651	543,380	543,352	501,271
Ammonium nitrate	421,487	434,690	383,358	—	—
Ammonium sulphate	—	177,726	—	—	—
Calcium carbide	672,568	789,426	659,021	500,781	370,294
Chlorine	1,192,081	1,262,362	1,214,416	989,805	800,833
Hydrochloric acid	407,551	381,026	342,475	296,913	227,686
Hydrofluoric acid	86,377	91,413	45,438	—	—
Nitric acid	447,088	471,717	483,197	427,656	346,977
Oxygen	13,943	18,495	16,530	12,801	8,682
Phosphoric acid	739,943	696,570	636,847	617,408	662,659
Soda ash (ammonia soda process)	4,375,017	4,538,398	4,407,600	3,788,583	3,606,826
Soda ash (natural)	181,783	179,580	163,523	136,172	117,574
Sodium bicarbonate	174,949	155,216	172,998	160,637	169,446
Sodium bichromate and chromate	80,672	81,975	81,963	78,955	83,415
Liquid sodium hydroxide (electrolytic)	1,129,312	1,182,883	1,115,200	939,878	743,219
Liquid sodium hydroxide (lime-soda)	734,993	688,565	663,492	634,291	685,994
Solid sodium hydroxide (electrolytic)	213,449	221,838	228,749	—	—
Solid sodium hydroxide (lime-soda)	244,015	234,514	241,624	—	—
Sodium sulphate	543,371	564,889	564,941	570,869	531,488
Sulphuric acid (chamber process)	3,169,197	3,237,217	3,147,590	2,914,722	3,011,929
Sulphuric acid (contact process)	5,517,873	5,302,160	4,703,193	—	—

Official Notices

THE Board of Trade announces that small quantities of German dyestuffs purchased on Government account have reached the United Kingdom and are now available for distribution for home use. Particulars may be had from the Dyestuffs Control, Board of Trade, Guardian Chambers, 28 Blackfriars Street, Manchester 3. Such dyestuffs are at present to be distributed at first hand only to dyestuff manufacturers.

The Board of Trade invites tenders for the purchase of shares in a number of companies, including Bayer Products, Ltd., manufacturers of chemical products (40,000 ordinary shares of £1 each, fully paid) and Glasso Paint Products, Ltd., manufacturers of varnishes, paints, enamels, cellulose and synthetic finishes (27,001 ordinary shares of £1 each, fully paid). Particulars of sale and conditions and tender form are obtainable from the Trading with the Enemy Department (Treasury and Board of Trade), T.E.4 (A.), 24 Kingsway, London, W.C.2.

The Control of Containers and Packaging (No. 4) (General) Order, 1945, now administered by the Board of Trade, limits the sizes of new glass bottles which may be used for a large variety of products for the home market but permits used glass bottles to be filled free of restriction. Firms are reminded that under the Order, if goods are packed in used glass bottles the onus of proof rests with the packer that the bottles have in fact previously been used. There are at present quantities of bottles on the market which come from Government surplus stores or as factory rejects or from other sources. Packers are reminded that these, unless they have previously been filled, are not used bottle and must accordingly be packed in conformity with the Packaging Order.

I.C.I. Works May Move

BECAUSE they have been ordered to stop repair work on walls damaged by floods, the I.C.I. copper works at Broughton may leave the city, it was revealed at a meeting of Salford City Council. Councillor J. H. Lester, chairman of the Rivers Committee, admitted that the work had been stopped by the River Irwell Catchment Board. "It may be that firms who have thrown waste into the river have caused the floods, and we have passed a resolution to prosecute any firms doing this," he said. The discussion began when Councillor A. G. Wild moved that a resolution that the Council should bear half the cost of a consulting engineer, appointed by the catchment board to report on steps to prevent future flooding, should be referred back to the River Irwell Conservatory Committee for future consideration.

U.S. Atomic Research Laboratory

CONSTRUCTION by the Atomic Energy Commission of the Knolls Atomic Power Laboratory on a site near Schenectady, New York, will start this spring, according to a recent announcement. The laboratory is being erected under the supervision of the U.S. General Electric Company, which will operate it for the Government when completed. It is expected that scientists and engineers will begin to occupy the new building by the middle of 1948.

The new atomic laboratory is to be located on part of a 386-acre tract in Niskayuna where, on another part of the property, General Electric's new research laboratory is at present under construction. Both laboratories, whose work will largely integrate, are to be operated as a unit under the direction of Dr. C. G. Suits, vice-president of the General Electric Company, and director of the Research Laboratory. A number of scientists for the project have already been recruited and more are being employed as rapidly as qualified men and women can be found, Dr. Suits states, adding that physicists, metallurgists, chemists and chemical engineers—technical men of all kinds—are needed.

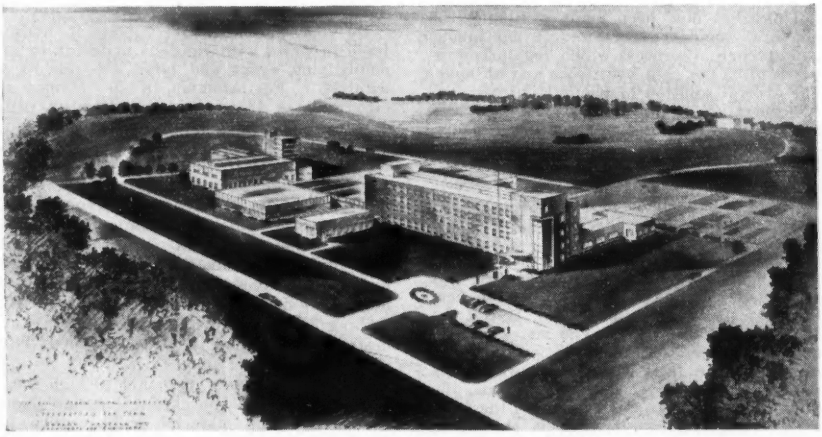
A series of buildings will form the Knolls Atomic Power Laboratory and in one will be located an experimental pile. Such a pile, it is expected, will form the firebox and boiler of future atomic power plants. Other buildings will be devoted to offices, metallurgy, chemical engineering and chemistry. Another building will house a 3,500,000-volt electrostatic (Van de Graaff) generator, for atom-smashing studies.

It was previously announced that the purpose of the new laboratory would be to conduct research in all phases of atomic power development, in addition to research on specific problems in connection with the operation of the Hanford Engineering Works, Washington, now operated by General Electric's Chemical Department.

Czech Two-Year Plan

Results of First Month

WITH the exception of the production of chemicals, glass and ceramics, all main Czechoslovak industries have attained the target figures set under the two-year plan for January, the first month in which the plan became operative. The chemical industry, which is reported to be handicapped by a severe shortage of raw materials, has reached merely 53.7 per cent of the planned figure, with glass and ceramics at 92.7 and 67.0 per cent respectively. Output of hard coal, totalling 1,394,500 tons, has exceeded the target by 6.8 per cent, while lignite output of 1,834,900 tons has been 2.3 per cent above the planned figure. Moreover, output of iron-ore at 127,376 tons, and steel production, amounting to 191,572 tons, have exceeded the target by no less than 14.6 and 4.2 per cent. These generally encouraging results have been obtained in spite of a number of bottlenecks, which had been aggravated by the severe winter.



Model of the Knolls Atomic Power Laboratory

CONTINUOUS PROCESS FOR HYDROLYSIS OF FATS

From Our New York Correspondent

THE American Institute of Chemical Engineers, meeting in Louisville, Kentucky, was recently told of a new continuous process developed for the converting of fats and oils into fatty acid and glycerine by hydrolysis with water. After several years of development by the Colgate-Palmolive-Peet Company and the Proctor & Gamble Company, a number of commercial plants are now under construction to produce fatty acids for soaps, cosmetics, greases, stearic acids, red oil, and many other uses. For producers splitting 3000 lb. per hour or more of oil, the new process offers relatively cheap, simple, continuous conversion of the fat to give a 97 per cent yield of fatty acids of good quality and an aqueous glycerine solution of 15 per cent concentration or better, which is readily concentrated and refined to chemically pure glycerine. By vacuum distillation, the fatty acids from dark coloured fats can be purified to a light straw colour, and so be used to make the finest quality product.

For more than seventy years fatty oils have been hydrolysed by batch processes to give the fatty acids. Up to the present time, the most satisfactory method for hydrolysing the fatty oils has been the method developed by Ernst Twitchell in 1890, which involves boiling the fatty oil with water, and a small amount of acid catalyst from 30 to 48 hours. Preliminary treatment of the oil is often necessary, and the catalyst must be removed afterwards

A New Method

There has now been made available, the chemical engineers were told, a continuous countercurrent process which regularly produces 97-99 per cent hydrolysis and an aqueous gycerol solution of about 15-25 per cent concentration containing very little fatty material. A pilot plant at the Colgate-Palmolive-Peet research laboratories in Jersey City, New Jersey, has been in operation for several years studying the process under various conditions and with a variety of fatty oils to prove the wide applicability of the process with uniformly high yields and low operating costs.

The continuous hydrolysis process, it was explained, consists essentially of a vertical stainless steel tower into which is fed the fatty oil and the water. The water falls as droplets through the fatty phase partially dissolving in the fatty material in which the reaction takes place. At the same time, the liberated glycerol is extracted from the fatty material by the counter-current stream of water which removes the glycerol and permits the reaction to go rapidly to practical completion. The fatty oil is fed at a controlled rate to the bottom of the tower where it contacts the aqueous glycerol leaving the column and extracts from it the small amount of fatty material dissolved in the aqueous phase. At the same time, water is fed to the top of the tower where it flows over trays in contact with the upwardly flowing split acids and extracts from them the water and glycerol dissolved in the fatty phase. After leaving the contacting sections of the tower, the two streams are brought to reaction temperature by direct injection of high pressure steam. The fatty acids discharge from the top of the tower through a back pressure control valve to a decanter where the water still suspended in the fatty acid is removed. From the decanter the fatty acids flow to storage tanks. The position of the interface between the fatty phase and the aqueous phase is maintained by regulating the discharge of the aqueous glycerol to the glycerol storage tanks.

Hydrolysing Ethyl Silicate

A NEW method of hydrolysing ethyl silicate makes the use of this convenient silica-depositing medium considerably more economical, according to an announcement by Carbide and Carbon Chemicals Corporation, of New York. This is an aqueous process eliminating the use of alcohol and thus affording a 45 per cent saving in cost, also reducing fire hazards involved in use of a volatile solvent.

By this method, ethyl silicate is hydrolysed in water with vigorous agitation or an emulsifying agent and large amounts of a catalyst. For example, if 20 volumes of ethyl silicate 40 are mixed vigorously with 4 volumes of 5 per cent hydrochloric acid, the mixture which is at first non-homogeneous becomes clear in five to ten minutes. After standing about an hour, this silicate solution can be diluted with 76 volumes of water to yield an opalescent solution containing about 8 per cent silica. Such aqueous solutions remain fluid for several days and deposit adhesive silica in the same manner as do the usual alcohol solutions. By making a slight adjustment of catalyst, any desired setting time is easily obtained. The cement or bond of pure silica which results is insoluble in water, resistant to high temperatures, and has no chemical action upon the surrounding material. The silica is itself affected only by strong alkalis and hydrofluoric acid.

Chemical Industry in Hungary*

THE production of aniline dyes has been successfully re-established in Hungary by five large factories, including the Pet nitrogen works and the Hungarian chemical works. Output at present is about 40,000 kilos per month of the aniline type. Hitherto these had been imported and used in large scale pre-war development of the textile and printing trades, products of which were largely exported to England, Turkey, and other countries. In 1944 imports of coal-tar dyes were valued at 21.3 million pg., of which the I.G. Farbenindustrie sent 18.1 million, and Switzerland 3.1 million. After the "liberation" the latter country took first place.

The cosmetic industry which now lacks little in the way of raw material is also quickly recovering; but the same cannot be said of the pharmaceutical section which is still struggling with various difficulties. Most of the important works have suffered serious damage. The largest of these, Chinoin Werke, had a pre-war turnover of about 25 million Swiss frs., of which one-fourth was exported. During the war output increased by about 100 per cent, and exports almost entirely replaced those of Germany in the Balkans. To-day sales are hardly 10 per cent of peace-time level and production is 50-60 per cent of that of 1938. Fairly large stocks have therefore accumulated. There is a claim by Jugoslavia against Hungary in respect of the Chinoin Werke.

The principal firm in the heavy chemical section is still the Chem. Werke Hungaria A.G. although they have lost the Phoenix works of Nagybanya to Rumania. There was at first some difficulty owing to shortage of raw materials and war damage; but factories engaged in manufacture of copper sulphate, hydrogen peroxide, sulphuric and hydrochloric acids, have made good progress and are rapidly recovering pre-war output standards. Various Hungarian firms, such as the Usines Chimiques d'Etat de Füzfö and the large artificial fibre and rayon firm of Nyergesujfalu, now more or less under State control, are taking part in international arrangements with Russian and American concerns. The government is also proposing to supply fertilisers to Holland and Belgium when sufficient raw material is available. But additional capital of some $3,000,000 is necessary.

The elimination of German competition has facilitated agreements on exchange of chemical products with Poland and Bulgaria, and generally it may be said that Hungary is making good progress in regaining a dominating position in central and southern European markets.

After some decline in the spring of this year (1946) coal output has lately shown an upward tendency, and now amounts to some 500,000 tons per month. Iron and steel production has likewise increased, the latter reaching 40,000 tons per month, or 74.2 per cent of the pre-war level. Of this, the State Mavag steel works at Diosgyor alone accounts for 14,000 tons per month, as compared with 18,500 tons in 1938 and only 1500 tons during the summer of 1945. Production of cast iron in 1938 was 27,000 tons per month, and is at present about 20,000 tons. On the other hand the mining of iron ore has seriously declined, and is at present only about 25 per cent of the pre-war level.

*From *L'Ind. Chim. et le Phosphate*, 1946, *33*, 209, and *Chim. et Ind.*, 1946, *56*, 433.

French Sulphur

BETTER utilisation of national resources to supply materials formerly imported continues to be urged and in some cases practised on an increasing scale in France. A practical example is that of sulphur. The Société Languedocienne de Recherches et d'Exploitations Minières commenced working the Narbonne (Malvezy) deposits in May, 1943, and by the beginning of 1946 had removed nearly 200,000 cu. m. of overburden, yielding some 40,000 tons of crude sulphur ore. At first this was ground and used without enrichment; but in 1945 a plant for concentrating by flotation was installed of 300 tons per day capacity, yielding 100 tons of 30 per cent sulphur content. The vineyards had been using, for lack of better, the 10 per cent material, of which no less than 300 kilos per hectare of vineyard was needed. It has now been found that the 30 per cent enriched grade is quite as efficient in the vineyards as pure yellow sulphur, though its sulphur content is 2½ to 3 times less than that of the pure element. This is confirmed by numerous trials carried out by the Ministry of Agriculture and also by the vineyard cultivators themselves. The output of the company for 1946 was about 35,000 tons—it will probably be more for 1947—and this output could take the place of 30,000 tons of imported yellow sulphur.

Deposits of Triassic gypsums, usually purer than those of other geological formations, have been found in the Buech valley on the right bank of the river Durance and at Var between Brignoles and Toulon. These together amount to several million tons, some of which is in the anhydrite form containing up to 23.50 per cent sulphur as compared with 18.6 per cent in the hydrate. According to *L'Industrie Chim.* (September, 1946) the Miramas sulphuric acid works will develop these for acid manufacture.

NEXT WEEK'S EVENTS

MONDAY, MARCH 17.

Royal Society of Arts. John Adam Street, London, W.C.2, 5 p.m. Dr. J. A. V. Butler, "Enzymes, their Isolation, Structure, Mode of Action and Place in Nature." (Second of the three Canter Lectures).

TUESDAY, MARCH 18.

Society of Dyers and Colourists (Huddersfield Section). Field's Café, 7.30 p.m. Dr. F. Townend, "Use of Acids in Wool Dyeing."

Royal Institute of Chemistry (London and S.E. Counties Section). "Cherry Tree," Welwyn Garden City, 8 p.m. Dr. A. M. Ward, "Training and Qualification of Chemists."

Institute of Petroleum. Manchester Engineers' Club, 6 p.m. Dr. Whalley, "Progress on the Synthesis of Fuels and Lubricants."

Chemical Society. University College, Nottingham, 7 p.m. Dr. A. Alexander, "Application of Surface Chemistry to Colloidal Problems." (Tilden Lecture).

WEDNESDAY, MARCH 19.

Association of Tar Distillers, 166 Piccadilly, London, W.1, 2.30 p.m. Annual General Meeting.

Society of Dyers and Colourists (Midlands Section), King's Head Hotel, Loughborough, 7 p.m. Dr. John H. Hill, "Chemistry and Application of Detergents."

THURSDAY, MARCH 20.

Royal Society. 4.30 p.m. Dr. H. D. Megaw, "Temperature Changes in the Crystal Structure of Barium-Titranium Oxide," Messrs. C. W. Bunn and E. V. Garner "Crystal Structure of Two Polyamides (Nylons)."

Chemical Society. Marischal College, Aberdeen, 7.30 p.m. Professor E. L. Hoist, "Recent Developments in the Chemistry of Starch and Glycogen."

SATURDAY, MARCH 22.

Institution of Chemical Engineers (N.W. Branch). Manchester College of Technology, 3 p.m. Mr. H. R. C. Pratt, "Purification and Azeotropic Dehydration of Acetonitrile."

Canadian Trade

For the second successive month Canada's imports during November last, valued at £49,540,990, represented an all-time record. Imports from the United States were again predominant, being nearly 75 per cent of the total. Imports in the first eleven months of 1946 totalled a value of £436,341,687, of which the United States contributed £314,913,898, the United Kingdom, £47,442,331. Canada's exports during the twelve months of 1946 were valued at £578,000,000—two and a half times the figure in 1939. The United States maintained its war-time position as principal market, taking goods to the value of £222,000,000—or 38.4 per cent of the total—while shipments to the United Kingdom continued at high level, being valued at £149,500,000—or 25.8 per cent of the total. Chemicals and allied products were imported by Canada in the first eleven months of 1946 to the following values: acids, £739,000; alcohols, industrial, £165,000; cellulose products, £1,513,000; drugs and medicines, £2,671,000; dyeing and tanning materials, £2,124,000; explosives, £195,000; fertilisers, £1,040,000; paints and varnishes, £2,142,000; inorganic chemicals, £2,908,000; potash and compounds, £141,000; soda and compounds, £1,195,000; other chemical products, £7,876,000.

New U.S. Products

New products and processes lately publicised in the United States include the following.

The process of manufacturing formaldehyde out of air and natural gas has been improved, it is claimed. By raising the working temperature, the process is completed in a small fraction of the time formerly required. The formaldehyde is then condensed by contact with a cool formaldehyde solution.

Bristles made from casein and water are shortly to be on the market. These are made by extrusion, forcing the mixture through a die on to a conveyor moving away from the die. In colour they are comparable to that of black horsehair or pig bristle. Resistant to oils and organic solvents, they should be especially useful for paint brushes.

Corrosite is the name of a practically impermeable air-drying film, said to be completely resistant to most acids, all alkalis and many chemicals. It is a combined thermoplastic and thermosetting film. The maker claims that it will bond to any clean surface; that it is electrolytically impervious; that its smoothness compares favourably to porcelain; that it will not crack, chip or lift and will withstand temperatures to 250°F.

Home News Items

Coal to Oil Firing.—Coal shortage difficulties have been mitigated by Athole G. Allen (Stockton), Ltd., where long-standing plans for converting their firing system from coal to oil have now matured. Their oil-firing equipment is now functioning.

Aluminium Production.—Total production of aluminium in the United Kingdom for 1946 was 80,135 long tons, made up of 31,545 long tons of virgin (all unwrought forms) and 48,590 long tons of secondary ingot (excluding recovery at Government depots from crashed aircraft).

Sorbic Acid.—This acid (2-4-hexadienoic acid) discovered in unripe apples 90 years ago, and of interest as a chemical intermediate in the vegetable oil, synthetic resin and pharmaceutical industries is now available in development quantities from the Carbon and Carbide Chemicals Corporation.

Dunlop Bores New Well.—Every 24 hours 1,800,000 gallons of water will be drawn from a new well 36 inches in diameter, now being bored 400 feet down at Dunlop's Speke factory. The new supply, added to the 600,000 gallons a day from the existing bore-well, will give as much water as that needed by a town of 60,000 inhabitants.

£750 Scholarship Winner.—A three-year scholarship, value £750, has been awarded by the Textile Institute to twenty-year old George H. Ewins, of Normanby Street, Bolton, a cotton spinning student at Bolton Municipal Technical College, where he has been attending classes four nights a week for three years.

Textile Institute Examination.—The annual examinations of the Textile Institute for the Associateship of the Institute will this year take place on the following dates: Preliminary, Wednesday, April 23; General Textile Technology, Wednesday, May 21. The examinations will be held at various centres throughout the British Isles and abroad.

Institute of Welding.—Over 70 members, including the chairman, Mr. S. P. Bennett, attended a meeting of North London branch of the Institute of Welding, held at South West Essex Technical College, Walthamstow, when there was a showing of the sound film "Steam," produced by Babcock and Wilcox, Ltd., and illustrating the principles embodied in water-tube boiler design and operation, together with details of construction and manufacture. The film was introduced by Dr. Harris, who afterwards answered members' questions.

Expansion at Port Sunlight.—Future expansion of the Port Sunlight factory was hinted at by Mr. G. A. S. Nairn, chairman of Lever Bros., Port Sunlight, Ltd., at Port Sunlight recently. "We are considerably worse off for raw materials than we were during the war," he said, "but all these difficulties will pass. We have ambitious plans for the future. Five years from now Port Sunlight will be greater and better than ever before."

Synthetic Bar Soap.—The perfection of a formula for synthetic bar soap is announced in Manchester, where a local soap manufacturing firm, having subjected the material, which employs no fat or oil, to searching tests, has applied for a licence to manufacture it on a commercial scale. The formula was produced by Mr. Fraser Johnston, a manufacturing chemist and former Manchester City Councillor.

D.M.P. Masks.—Anti-midge masks, impregnated with D.M.P.—are to be on sale to anglers and agricultural workers in Scotland this summer if present plans mature. This is a development of the work done earlier last year by a team of Scottish biologists and entomologists in tracking down the many varieties of midges and preparing a repellant (D.M.P.) which effectively prevented the attacks of midges.

Atomic Power Stations.—Atomic power stations will be in operation within the next ten or fifteen years to relieve coal-burning power stations, according to a forecast by Professor M. L. E. Oliphant, addressing South Staffordshire and Warwickshire Institute of Mining Engineers. In the future, said Professor Oliphant, we should probably see coal as the raw material of an enormous chemical industry, not only for things like plastics and much material for industry developing from coal, but for edible fats and oils.

Government Disposals.—Up to the end of last year the Ministry of Supply had disposed of surplus stores in the United Kingdom to the value of £182,000,000. During 1946 miscellaneous stores, including chemicals, to the value of £1,841,279 were sold to outside purchasers, in addition to £677,500's worth re-distributed to Government departments. In value, chemicals constituted the largest sales, notably: bleach powder, £81,000; polythene, £9000; calcium phosphate, £27,000; caustic soda, £13,000; glycerine, £349,000; insecticide spray, £56,000; filter powder, £14,000; pen-

taerythritol, £16,000. During the war large quantities of bleaching powder were purchased by Government departments for possible use in de-contamination. A market was found, principally for export to Scandinavia for bleaching paper, and the entire lot has now been sold.

U.K. Tin Position.—Stocks of tin metal and of tin ore in the United Kingdom declined during January. Ministry of Supply stocks at the beginning of the month totalled 7779 long tons, production amounted to 3112 long tons, making 10,981 long tons. Deliveries were 2917 long tons (2419 to U.K. consumers, 498 for export). At January 31 stocks were left at 7973 long tons. Consumers' stocks at the beginning of the month totalled 4130 long tons, deliveries were 2319 and consumption 2639 long tons.

Purifying Widnes Air.—A conference took place recently at Widnes to discuss measures for securing a purer atmosphere locally. The chairman of the local Health Committee presided; the Ministry of Fuel and Power was represented; and Mr. H. G. Howson, Alkali Inspector, was also present. Mr. Howson believed a good deal could be done so far as chemical fumes and dust were concerned. The local Medical Officer referred to the improvement in the emission of dust from the I.C.I. power sation. The conference resolved on co-operation with the local authority in all practical means to reduce smoke and a committee was set up, including representatives of industry.

Casting Pit Refractories.—Adenbury Brickworks, Wrexham, has been acquired by Thomas Marshall and Co., of Loxley, near Sheffield, as a branch works for manufacturing steelworks-casting pit refractories. This will be the only works in North Wales specialising in this product. It is intended to serve the steel-making areas of Wales, Lancashire, and the Western Midlands. Casting pit refractories are in short supply and there is much demand for export to the Continent, which it is expected to meet. The refractories are used to control the pouring of molten steel into ingots and for ingot ladle-lining bricks and ingot mould pot bricks. The new process involves using white clay for the first time at the works. This clay is mined at Ffrith, Flintshire, where there are good deposits.

Seaweed Investigations. — The Scottish chemical industry is watching with interest plans for the development of a seaweed industry on North Uist. Mr. William MacKenzie, of the engineering staff of the Scottish Seaweed Research Association is now on the island engaged in practical engineering work on the collection, baling, drying and shipment of seaweed and to determine whether or not this area is suitable for a permanent factory. The work will continue for six months and on its success depends the decision to establish a new industry in North Uist to extract from seaweed the raw materials for a variety of other industries. Success will depend largely on the degree to which collection of weed can be mechanised, the amount of co-operation by the islanders, and the readiness of various industries involved to use products derived from the weed.

Bowen Trust.—The Scientific Instrument Manufacturers' Association has received from Mr. W. Bowen a substantial capital sum, the income of which he wishes to be devoted to the encouragement and development of invention, design, research processes and manufacturing technique in the industry. Income from the trust fund is to be devoted each year to prizes for papers submittted by employees of members of the S.I.M.A. For the current year the council is to award five prizes to an approximate total of £125 for the best five papers on a new invention; an improvement in design; an improvement in manufacturing technique; a new development or new process arising from research; all as affecting or relating to a scientific instrument. Papers must be submitted not later than April 30, 1947, to the secretaries, Binder, Hamlyn and Co., River Plate House, South Place, London, E.C.2.

For the purpose of buying chemicals and attending the spring meeting of the American Chemical Society, Dr. Henry de Laszlo, managing director of L. Light & Co., Ltd., fine chemicals manufacturers, Wraysbury, Bucks., has sailed for the U.S.A. Research workers in organic chemistry, bio-chemistry and physiology who seek special organic chemicals, reagents or drugs for their work, which are not available in this country, should send in a list to L. Light & Co. or to Dr. de Laszlo, at 20 West 86th Street, New York City. He will endeavour to bring back at least part of their requirements by the middle of May.

Chemical Prices St'll Rising

Chemicals and oils rank fifth among the commodities contributing to the general increase of 0.9 per cent in wholesale prices in February. By comparison with the previous month, wholesale prices of chemicals and oils were 1.6 per cent higher; the largest increase by any individual item was the +2.2 per cent recorded for food and tobacco. Prices of chemicals and oils are now 13.2 per cent higher than in February, 1946.

Personal

MR. J. MACASKILL has been appointed an additional director of British Glues and Chemicals, Ltd.

MR. GEORGE BRUNTON, chemist at the Gaskell Marsh works of I.C.I., Ltd., in Widnes, has retired after over 47 years' service.

MR. S. A. WIKNER and MR. B. P. HILL have been elected vice-presidents of the Newcastle Chemical Industry Club in recognition of their many years' work for the organisation, of which Mr. A. Trobridge is president for the 1947-8 season.

MR. J. G. CROWTHER, author of many books on the history and social relations of science, science correspondent for 20 years of the *Manchester Guardian*, has been chosen by the World Federation of Scientific Workers as secretary-general designate.

MR. T. C. BETTERIDGE (Cooper, McDougall & Robertson, Ltd.) has been elected chairman for 1947 of the British Disinfectant Manufacturers' Association. Other principal officers elected were: vice-chairman, MR. A. J. BLACK; hon. treasurer, MR. VICTOR G. GIBBS; and hon. auditors, MESSRS. F. C. SEAGER and A. GALE.

MR. ALLAN J. HOLDEN, B.Sc., F.R.I.C., as delegate, and MR. F. H. MACKENZIE and MR. A. S. SWANN as deputies, representing the Association of British Chemical Manufacturers; MR. W. J. WILLIAMS, M.P.S., F.C.I.S., deputy, Pharmaceutical Export Group; DR. W. E. DE B. DIAMOND, F.R.I.C., F.C.I.S., deputy, British Plastics Federation; MR. T. J. OFFER, delegate, and MR. A. CHARLES KING and MR. F. W. GREENWOOD, deputies, Scientific Instrument Manufacturers' Association, are among 64 representatives of trade organisations covering industries in the London Section of the British Industries Fair who have been appointed to an Advisory Committee in connection with post-war Fairs.

Obituary

WITH the death at the age of 40 of Dr. Alfred Hartley Jay, the scientific world loses one who was known internationally for his metallurgical work in connection with the crystallographic X-ray examination of ferrous materials and also for his co-operative work on refractories with Dr. J. H. Chesters. Dr. Jay died from head injuries following a motoring accident on February 22.

Since 1933, Dr. Jay had been a member of the Research and Development Department of United Steel Companies, Ltd. He published numerous papers on X-ray examination of metals and other subjects.

From his friend and colleague, Dr. Chesters, we have received an appreciation of him, from which we quote. Dr. Jay possessed a rare combination of gifts, writes Dr. Chesters. While his own peculiar field was X-ray analysis, he made an equal contribution in the field of refractories and

The late Dr. A. H. Jay.

notable contributions to various aspects of metallugical work. Dr. Jay joined United Steel Companies, Ltd., with a very enthusiastic recommendation from Professor W. L. Bragg, under whom he had worked. His work with the United Steel Companies was of outstanding quality. Not content with the available equipment for the measurement of spacings on films, he designed his own apparatus and followed it with a very simple and practical form of photometer.

His superb technique was well illustrated by his work on the stabilisation of dolomite bricks and the constitution of sea-water magnesia. It was his X-ray analysis of a number of "perished" dolomite bricks that gave the clue as to the real cause of failure and pointed the way to the stabilised dolomite brick as we know it to-day. His initial X-ray survey of the field of refractories has long since been accepted as a standard. His achievement in the field of fireclay refractories is still scarcely appreciated.

The death has taken place suddenly at the age of 41 of MR. HARRY TILLEY, a valued employee of W. J. Bush & Co., Ltd., chemical manufacturers, Widnes. Joining the firm in 1932, Mr. Tilley showed such aptitude that in record time he gained promotion to foreman status in the process department, eventually attaining seniority.

Chief analyst at the Gaskell Marsh works of I.C.I., Ltd., at Widnes, MR. WILLIAM TURBERVILLE PHILLIPS has died suddenly, aged 61. Mr. Phillips, who was a member of the British Association of Chemists, joined I.C.I. 18 years ago when the Kemet Works were opened in Runcorn, subsequently being transferred to Widnes.

Overseas News Items

German synthetic fuel.—The manufacture of synthetic fuel has been resumed in several German plants, including the Krupp works.

Coke shortage.—The lack of coke has necessitated the closing down of three blast furnaces in Luxembourg.

Casein Glue.—Exports of casein glue from Argentina will in future be exclusively handled by the Institute for the Promotion of Foreign Trade.

More Flaxseed.—World production of flaxseed was 7 per cent higher in 1946 than in 1945. United States production was double the average for the years 1935-9.

Argentine linseed crop.—The Argentinian linseed crop has officially been estimated at 1,050,000 tons, a decline by 15,000 tons over the first estimate.

Uranium on Bornholm.—The discovery of uranium on the Baltic island of Bornholm is reported from Denmark. The deposits are not expected to be large.

Pig Iron Output in U.S.—Pig iron output in the United States for the year 1946 amounted to 45,378,530 tons and was equivalent to 67.7 per cent of capacity operation. The output for 1945 was 54,166,482 tons.

Fats and Oils in U.S.—The United States will fall short of its 10,700,000,000 lb. requirement of fats and oils by 1,600,000,000 lbs., according to a Department of Commerce estimate.

Dyes from Germany to Holland.—Holland has made contracts for the import of dyes and other materials to the value of about £250,000 under the first commercial agreement concluded between a European country and the Anglo-American zone of Germany.

Rhone salt industry.—A subsidiary—Cie Salmiere de la Carmagne—of one of the leading chemical and metallurgical groups in France has been founded to control much of the large salt industry in the Rhone Valley.

First Canadian chloroform.—Chloroform of commercial grade is now being manufactured, for the first time in Canada and in substantial quantities, by Canadian Industries, Ltd., Shawinigan Falls, Quebec.

Mercury prices down.—Purchase of large stocks of mercury held by Germany and Japan, of which U.S.A. Reconstruction Finance Corporation is to import some 2000 flasks, is depressing mercury prices in many areas; the Spanish-Italian Mercurio Europea has reduced prices per flask c.i.f. New York from $80 to $67.

Australian export prohibitions.—The Australian Minister for Trade and Customs has prohibited the export of the following goods: cresylic acid, sodium arsenite, strychnine alkaloid, strychnine hydrochloride, nitrate and bisulphate, prepared insecticides and sheep washes containing nicotine and its preparations. The export of wattle bark and mallet bark, used in tanning, has also been prohibited, as it was found necessary to conserve supplies for the home market.

Labour Stoppages in U.S.A.—A total of 4,335 stoppages in United States industry between January and November last cost 107,475,000 man-days, 148,000,000 tons of coal, 12,000,000 tons of steel and other commodities valued at billions of dollars. The year set up a new record. Working time lost was more than three times the peak figures for the previous record year, 1945, while the number of workers involved, 4,545,000, exceeded the previous record figure of 4,160,000 in 1919.

S. African control of iron.—Use of iron and steel has again been placed under Government control in South Africa, owing to the great demand, diminished receipt from Great Britain and the U.S.A., and the fact that the home industry produces only 50 per cent of South Africa's needs. The control embraces iron and steel in bulk, a wide range of manufactures, tinplate or terneplate and goods manufactured from them.

International Tin Study.—The eight countries represented at the international tin conference in London last October are reported to have intimated acceptance of the proposed formation of a Tin Study Group; and it is hoped to arrange the first meeting in Brussels early in April. The eight countries are: Belgium, Bolivia China, France, Netherlands, Siam, United Kingdom and United States.

Soviet control Austrian edible oil factory.—A branch of the Soviet commercial administration in Austria has taken control of the edible oil factory at Atzgersdorf in the Russian zone of Vienna, which belongs to the Unilever organisation. A director with a junior Russian army rank has been in occupation since January and employees have been notified they are to work for the Soviet Union.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

FLUSHIEMERE BARYTES MINES LTD. (formerly SOUTHERN TAR DISTILLERS LTD.), London, S.W. (M., 15/3/47.) January 22, £1000 debenture, to Crow Catchpole & Co., Ltd.; general charge. *£3000. January 14, 1947.

Satisfactions

EAST RIDING CHEMICAL CO., LTD., Hull. (M.S., 15/3/47.) Satisfactions January 24, £1000, £2000 and £1000, all registered January 22, 1937.

POWELL & SCHOLEFIELD LTD., Liverpool, chemical manufacturers. (M.S., 15/3/47.) Satisfaction January 25, £675, registered March 6, 1940.

Company News

Net profit of £3799 (£3027) is reported by **Gas Purification and Chemical Co., Ltd.**, for 1946 and dividend of 8 per cent (same).

An interim dividend of 10 per cent (same) payable on March 31, is announced by **Boots Pure Drug Co., Ltd.**

Net profit of £151,647 (£84,200) is reported by **Blythe Colour Works,** and a final dividend of 60 per cent (65), making a total for the year of 80 per cent (65), is declared.

In 1946 **Viscose Development Co., Ltd.,** made a net profit of £34,292 (£11,480). An ordinary dividend of 7 per cent is being paid, making 10 per cent (same).

Expenditure on new plant and development of West Coast Mines by **Electrolytic Zinc of Australia** amounted to £11,146 (£12,250) in the year ended June 30, 1946. Net profit was £381,537 (£324,491).

It is reported from Southern Rhodesia that **Lever Brothers and Unilever** will in April take over control of the Express Nut-oil and Soap Works, Salisbury, largest producer of the kind in Central Africa and consuming 75 per cent of the colony's groundnut output.

Profit for 1946 was £938,085, announces **African Explosives and Chemical Industries, Ltd.,** with a cash dividend of 7½ per cent (nil). Capital commitments, mainly on projects already announced, total £3,000,000, raising of which is being prepared.

The Aluminium Wire and Cable Co., Ltd., formed recently by the British Aluminium Co., Ltd., Hawker Siddeley Aircraft Co., Ltd., and Tube Investments Ltd., is to purchase premises at Port Tennant, Swansea, from the Ministry of Supply and will take over on May 1. Modifications to buildings and installation of plant will be carried out as soon as possible, and it is anticipated that some production will start towards the end of the year. The company has temporary offices at Salisbury House, Circus Place, London Wall, London, E.C.2.

New Companies Registered

Rubber Industries and Shermans Chemicals, Ltd. (430,362).—Private company. Capital £30,000 in £1 shares. Subscribers: H. Paterson, G. Bramley. Registered office: 19, Eastcheap, London, E.C.3.

Clorex-Chemical Co., Ltd. (430,513).—Private company. Capital £1000 in £1 shares. Directors: M. Bevan and J. Edwards. Registered office: 77 Dock Street, Newport, Mon.

Ajama, Ltd. (429,132).—Private company. Capital £1000 in 1000 ordinary shares of £1 each. Manufacturers of synthetic waxes, chemicals of all kinds, etc. Directors: V. Manolescue, J. Pullan. Registered office: Eagle House, Jermyn Street, London, S.W.1.

Manutil, Ltd. (430,678).—Private company. Capital £100 in 100 shares of £1 each. Manufacturers of fertilisers, chemicals, etc. Subscribers: R. Johnston; Ruth Stafford. Registered office: 59 Hamilton Square, Birkenhead.

Tebu Trading Co., Ltd. (430,068).—Private company. Capital £500 in £1 shares. Manufacturers of tar of all kinds and all chemical and metallurgical products, etc. Subscribers: Canisius van Seumerew; E. Feist. Registered office: 35 Queens Gate, London, S.W.7.

Blackfriars Rubber Co., Ltd. (450,038).—Capital £10,000 in £1 shares. Manufacturers of chemicals for use in manufacture of rubber, processing raw and synthetic rubber, reclaimed and waste rubber and rubber latex, etc. Directors: J. Smith, H. Beattie. Registered office: 3 York Street, Manchester.

Chemical and Allied Stocks and Shares

AT the beginning of the week stock markets showed a widespread reaction, attention being centred on the economic policy debate in the Commons. British Funds lost further ground on doubts whether the Government's cheaper money policy can be

maintained, but later developed a steadier tendency. Industrials were generally easier, though selective demand produced a number of good features.

Chemical and kindred shares recorded small movements. Imperial Chemical strengthened to 44s. 7½d., aided by higher dividend hopes; but Turner & Newall eased to 85s.; United Molasses were 55s. 6d.; and Dunlop Rubber 70s. 9d. A feature has been continued activity in shares of companies connected with plastics which has followed the big increase in interim dividend announced by O. M. Kleemann. Shares of the latter were £5½, while on the new issue proposals De La Rue showed firmness at 75s., and elsewhere British Industrial Plastics 2s. shares were 9s., and Lacrinoid Products rose to 14s. British Xylonite remained firmly held and quoted at £7⅛.

In other directions, W. J. Bush were 92s. 6d.; British Drug Houses 59s. 6d.; Greeff-Chemicals Holdings 5s. shares 13s. 6d.; and B. Laporte 97s. 6d. British Aluminium firmed up to 45s. on the big demand for the metal. Birmid Industries were 92s. 6d.; British Oxygen 98s. 9d.; and British Match 55s. 9d. Reflecting buying of shares of companies with important overseas interests, Lautaro Nitrate rose to 33s. Borax Consolidated 58s. 3d., Pinchin Johnson 55s. 6d., and Babcock & Wilcox 73s. 9d. Recognition of the company's important non-colliery interests drew attention to Powell Duffryn, which moved up to 28s. 3d.; while, helped by the interim dividend, Thomas & Baldwins were 13s. 9d. Stewarts & Lloyds have been firm at 59s. on the company's big expansion programme. Dorman Long, United Steel, and Colvilles were relatively steady, movements on balance not exceeding more than a few pence. Guest Keen were 47s.; Staveley 60s. 3d.; and Allied Ironfounders 63s. 9d.

The rising tendency in world metal prices had little influence on Amalgamated Metal shares at 19s. 9d., while Imperial Smelting were 21s. 3d. Metal Industries "B" were steady at 61s. 9d. on the new issue plans, but elsewhere Renold & Coventry Chain came back from 75s. to 70s. on the new share proposals. Low Temperature Carbonisation 2s. shares remained active, but at 5s. 6d. lost part of their recent advance.

Associated Cement eased to 65s., and British Plaster Board to 32s. 3d. Lever & Unilever have been steady around 54s.; and on higher dividend hopes, General Refractories held their rise to 24s. 10½d. Textiles lost a few pence on disappointment with the industry's quota under the latest fuel proposals. Bleachers were 13s. 3d.; Calico Printers 21s. 7½d.; and Bradford Dyers 24s. 9d. Courtaulds at 53s. 6d. kept relatively firm on higher dividend talk, though no change is generally expected at this stage. British Ropes at 12s. 3d. remained under the influence of the dividend increase, but Triplex (35s.) came back earlier in the week with motor shares.

Boots Drug (64s. 6d.) receded after an earlier rise, Sangers were 34s., Timothy Whites 48s. 6d., and, in other directions, Blythe Colour Works 4s. ordinary at 53s. 9d. lost part of the rise which followed the recent dividend announcements. Oil shares fluctuated, but Anglo-Iranian have been firm at £7¾ moved higher again. Both Shell and Burmah were in demand after earlier small declines.

British Chemical Prices

Market Reports

A STEADY demand but restricted activity characterised most sections of the industrial chemical market. At the consuming end operations are not yet on a full scale, while chemical production is below capacity because of the continued shortage of coal. The demand for export remains strong and prices in all sections are firm. Bleaching powder, formaldehyde and nitrate of lead are in good request, and there is demand for copper sulphate at the recently increased price. Among the coal-tar products, naphthalene is dearer and demand exceeds supply.

MANCHESTER.—The coal shortage continues to interfere with normal operations of the Lancashire textile mills, but the reduced outlet for heavy chemical products in this and other districts seems to be more than offset by the lightness of the supply situation. There is ready absorption of most descriptions and a continued firm range of prices. Offers of soda ash and other alkalis especially are below what could comfortably be absorbed. Pressure on sulphur and many classes of fertiliser materials is showing a seasonal expansion, with the potash variety in particular in short supply, while a brisk demand in most sections of the tar products market has been reported.

GLASGOW.—There has been no change in the Scottish heavy chemical trade this past week as there still is a considerable number of firms closed down due to the lack of fuel. Inquiries and orders have been on the usual heavy scale but manufacturers have had to limit their supplies in some cases by 50 per cent, and in consequence, many regular orders have to be turned down. Business has been very active in the export market and orders have been received for sulphuric acid, bleaching powder, Glauber salts and copper sulphate, but in this market as well shortages are continuing to affect the ability of suppliers to accept business, with a result that many orders have been executed in part quantities.

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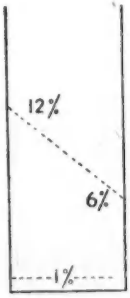

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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

Complete Specifications Open to Public Inspection

Vat dyestuffs.—Ciba, Ltd. July 27, 1945. 22307-8/46.

Unsymmetrical dichlorethylene. — Compagnie de Produits Chimiques et Electro-Metallurgiques Alais, Froges, et Camargue. July 24, 1945. 20921/46.

Articles coated with organo-silicon compositions.—Corning Glass Works. July 25, 1945. 9698/46.

Silicon-containing polymers.—E. I. du Pont de Nemours & Co. July 24, 1945. 22035/46.

Dispersions of polymeric materials.—E. I. du Pont de Nemours & Co. July 26, 1945. 22301-2/46.

Stretching rolls.—E. I. du Pont de Nemours & Co. July 26, 1945. 22303/46.

Obtaining by galvanic means a coating for protecting magnesium from corrosion.—H. M. Freud. July 26, 1945. 18691/46.

Polymerisation of alpha-haloacrylic compounds.—General Analine & Film Corporation. July 26, 1945. 19629/46.

Alpha-haloacrylic compounds.—General Analine & Film Corporation. July 26, 1945. 19630/46.

Polystyrene.—Imperial Chemical Industries, Ltd. June 12, 1943. 11192/44.

Quaternary ammonium phenoxides.—Imperial Chemical Industries, Ltd. July 27, 1945. 22304/46.

Synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14, 1945. 21046-56/46.

Resinous condensation products.—Monsanto Chemical Co. March 16, 1943. 12645/44.

Pyridinium compounds.—Roche Products, Ltd. July 25, 1945. 17814/46.

Crotonic acid.—Shawinigan Chemicals, Ltd. February 2, 1945. (Divided out of 15522/45.) 328/47.

Pest control compositions.—Sherwin-Williams Co. July 26, 1945. 21666/46.

Aminopyrazine.—Soc. Des Usines Chimiques Rhone-Poulenc. July 26, 1945. 21308/46.

Granulation of cobalt and nickel.—Soc. Generale Metallurgique de Hoboken. November 23, 1944. 38118/46.

Solutions of interpolymides and products obtained from such solutions.—Soc. Rhodiaceta. July 25, 1945. 18995/46.

Insecticides.—American Cyanamid Co. July 28, 1945. 20893/46.

Insecticides.—American Cyanamid Co. Dec. 9, 1939. 36835/46.

Vacuum Physical Laboratories

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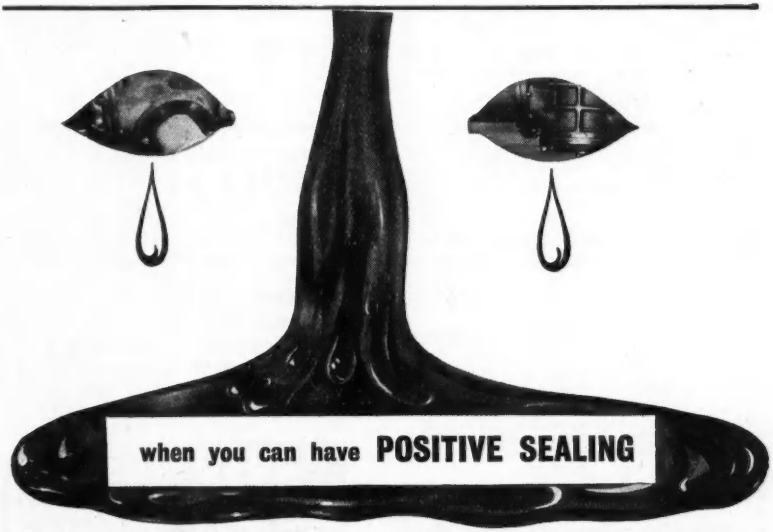

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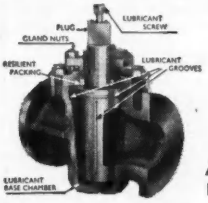

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Hydrogenation of general application to organic or inorganic synthetic products.—E. L. D. Astecky. Aug. 1, 1945. 32123/45.

Sulphuric acid leuco esters of anthraquinone azo dyestuffs.—Durand & Huguenin A.G. July 28, 1945. 23958/45.

4-Chlorophenyl ethers.—J. R. Geigy A.G. Aug. 3, 1945. 23054/46.

Condensation products having a tanning action.—J. R. Geigy A.G. Aug. 3, 1945. 23113/46.

Purification of water.—J. Kruger. Dec. 16, 1941. 37474/46.

Recovery of penicillin from an aqueous solution therefor.—Lederle Laboratories, Inc. July 28, 1945. 21393/46.

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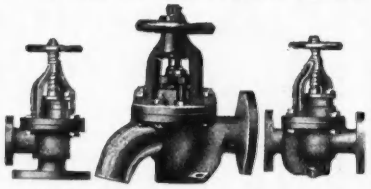
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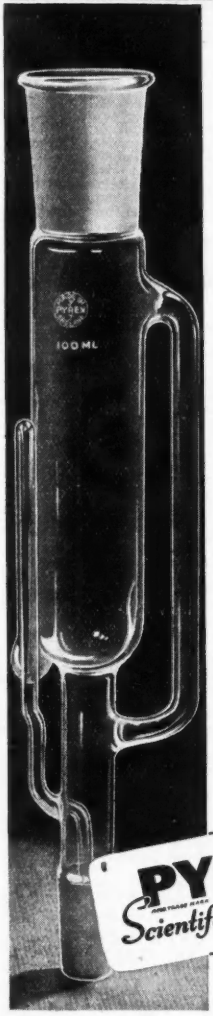

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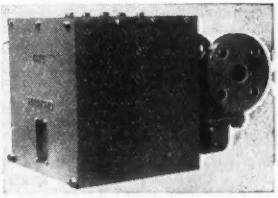

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